

Figure 1.—Test model installed in the NASA Glenn 9 X 15 Foot Wind Tunnel.

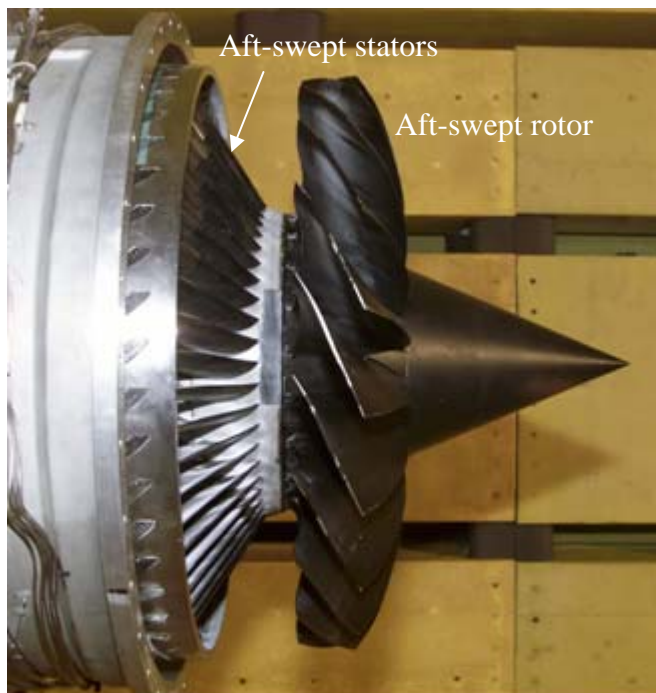
Variable Flow
Exit Nozzle



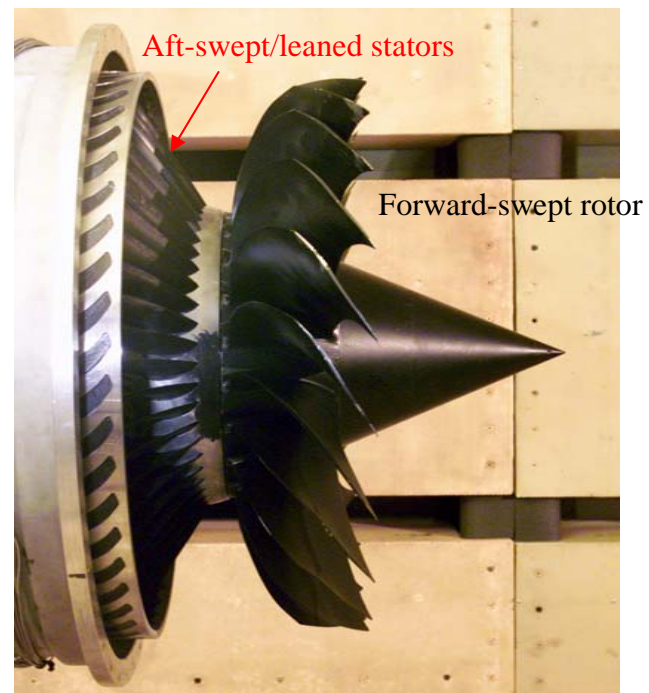
Bellmouth
Inlet

Figure 2.—Photographs of the rotors and stators that were tested.

a) Side view of aft-swept fan model.



b) Side view of forward-swept fan model.



c) Swept stators tested with aft-swept fan.



d) Swept and leaned stators tested with forward-swept fan.



Figure 3.—Photograph of LDV optics mounted to traverse table located on the side of the test model in the NASA Glenn 9 X 15 Foot Wind Tunnel.

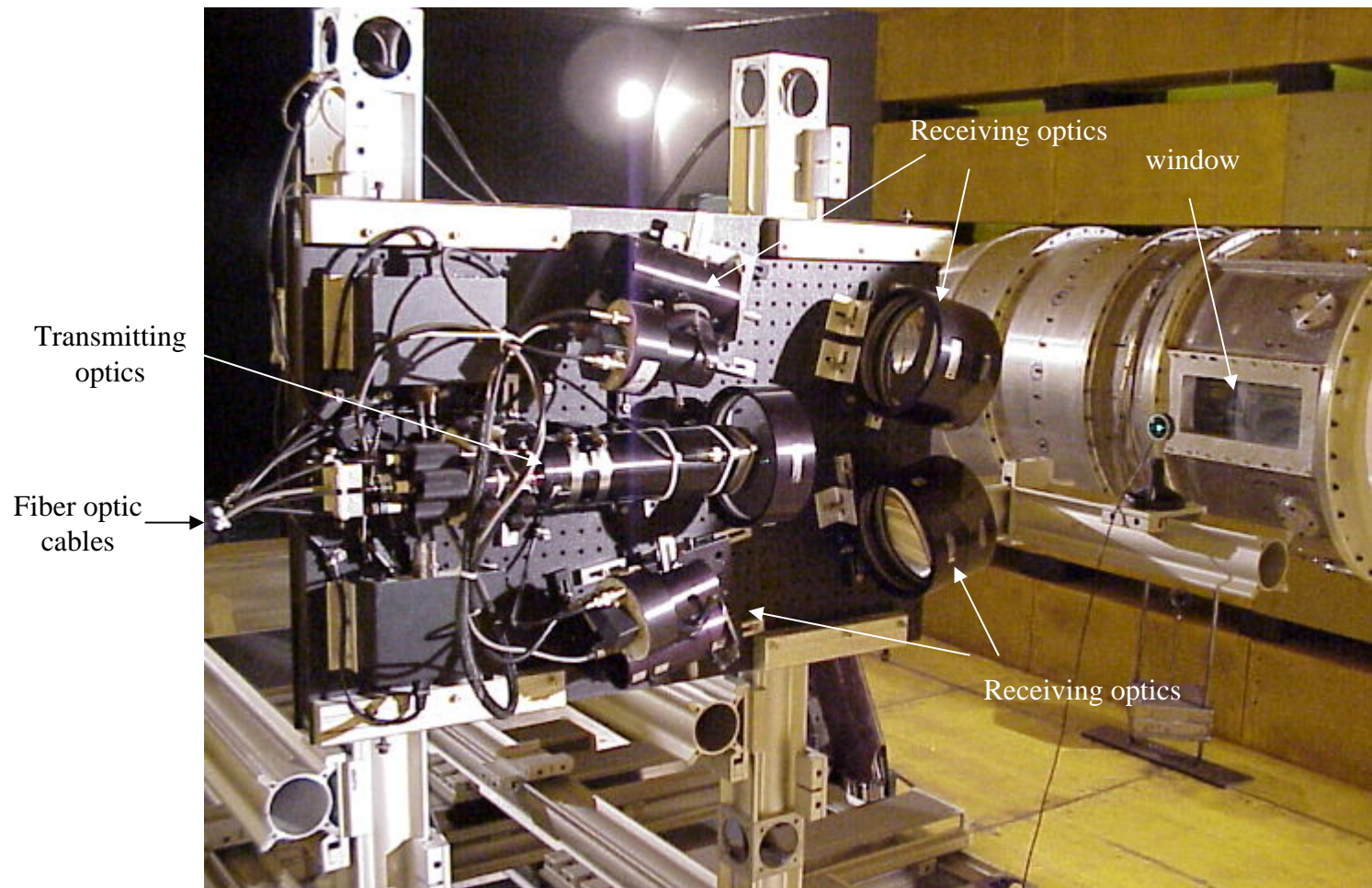
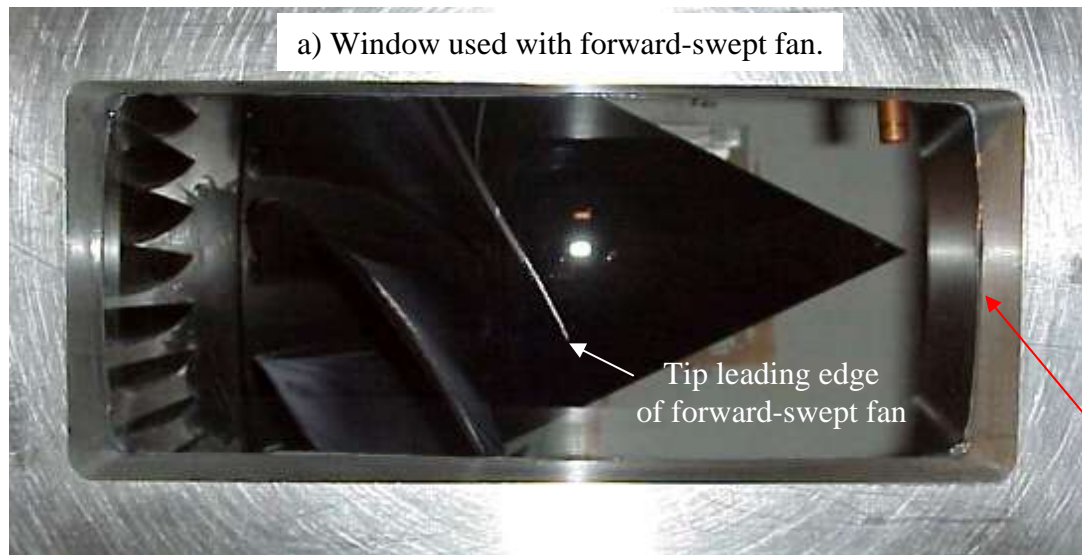


Figure 4.—Windows which permitted optical access to the internal model flows.



Upstream edge of the windows was used as reference location during LDV testing



Figure 5.—a. Schematic showing side view of the forward-swept fan and LDV measurement locations at which data were obtained at the low-speed condition (9510 RPMC, 913 ft/s tip speed, 0.817 tip Mrel). b. Schematic showing side view of the forward-swept and aft-swept fans and LDV measurement locations at which data were obtained at the mid-speed condition (12,500 RPMC, 1200 ft/s tip speed, 1.074 tip Mrel). c. Schematic showing side view of the forward-swept and aft-swept fans and LDV measurement locations at which data were obtained at the mid-speed condition (13,830 RPMC, 1328 ft/s tip speed, 1.19 tip Mrel).

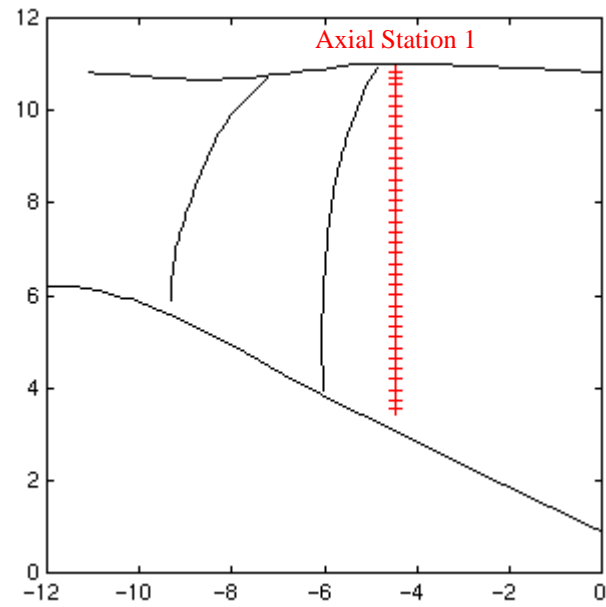
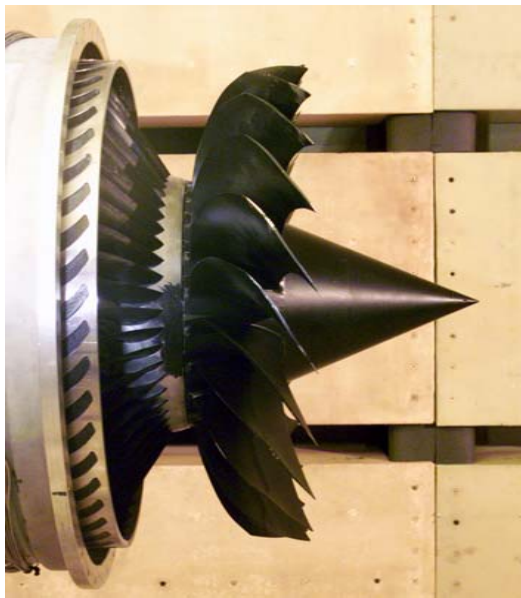


Figure 5a.—Schematic showing side view of the forward-swept fan and LDV measurement locations at which data were obtained at the low-speed condition (9510 RPMC, 913 ft/s tip speed, 0.817 tip Mrel).

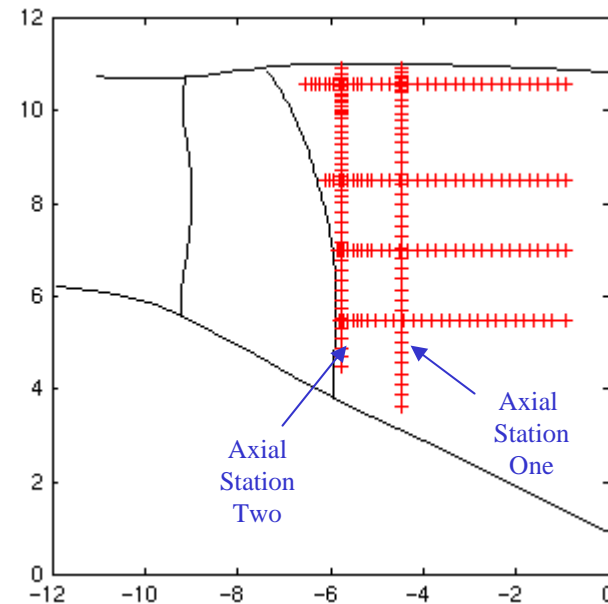
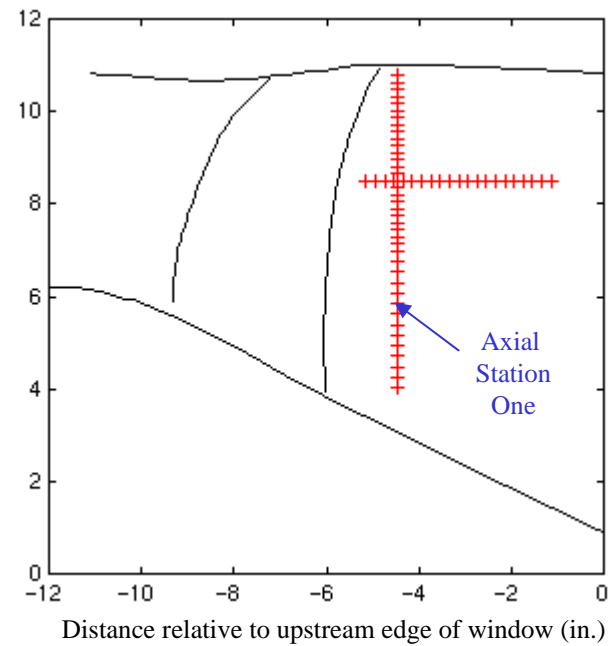
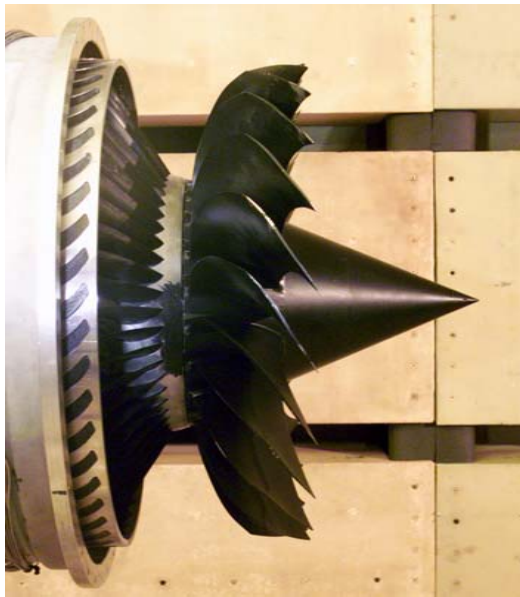


Figure 5b.—Schematic showing side view of the forward-swept and aft-swept fans and LDV measurement locations at which data were obtained at the mid-speed condition (12,500 RPMC, 1200 ft/s tip speed, 1.074 tip Mrel).

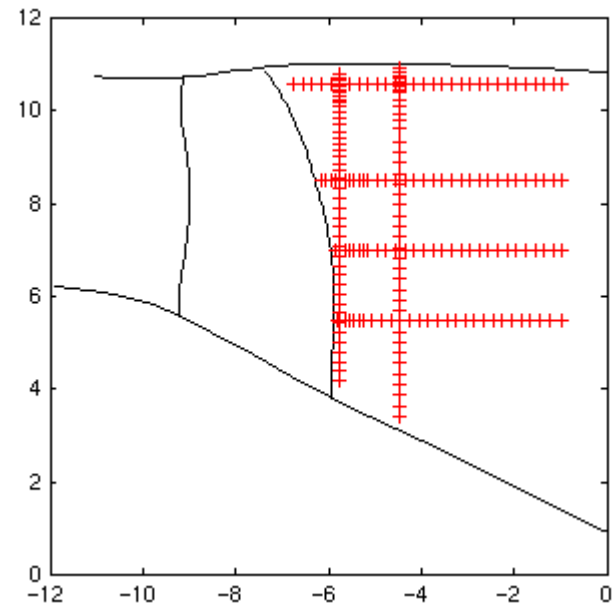
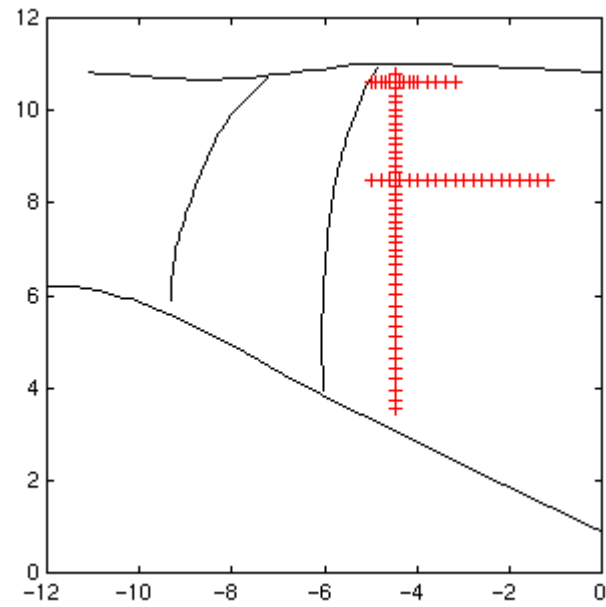
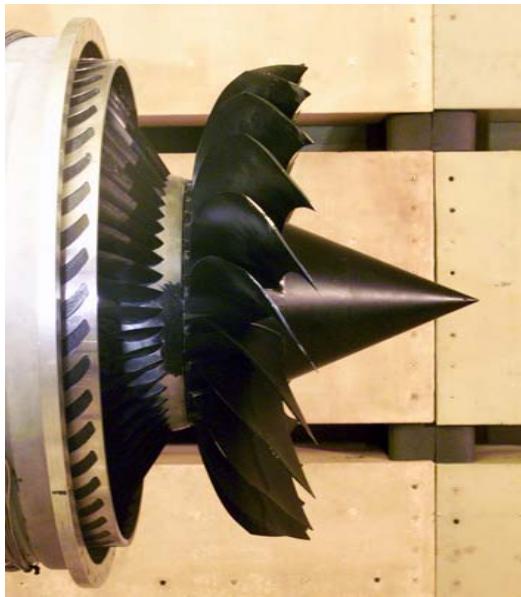
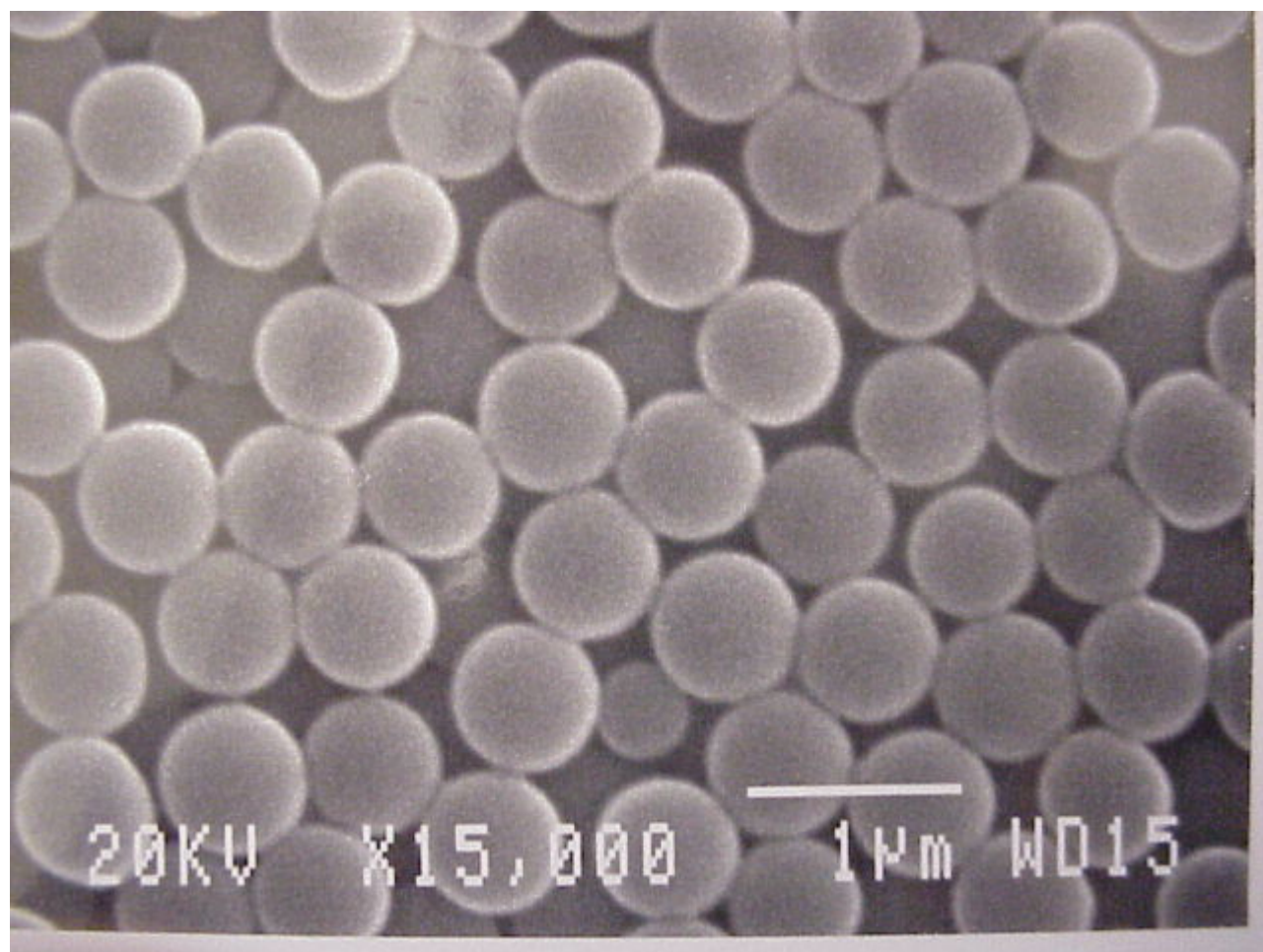


Figure 5c.—Schematic showing side view of the forward-swept and aft-swept fans and LDV measurement locations at which data were obtained at the mid-speed condition (13,830 RPMC, 1328 ft/s tip speed, 1.19 tip Mrel).

Figure 6.—Scanning electron microscope photo of polystyrene latex particles used as LDV seed.



20KV

X15,000

1µm

WD15

Figure 7.—Illustration of LDV data reduction process.

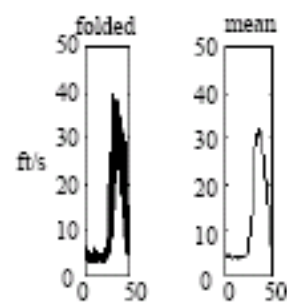
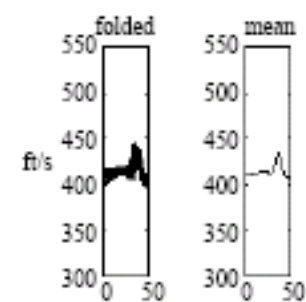
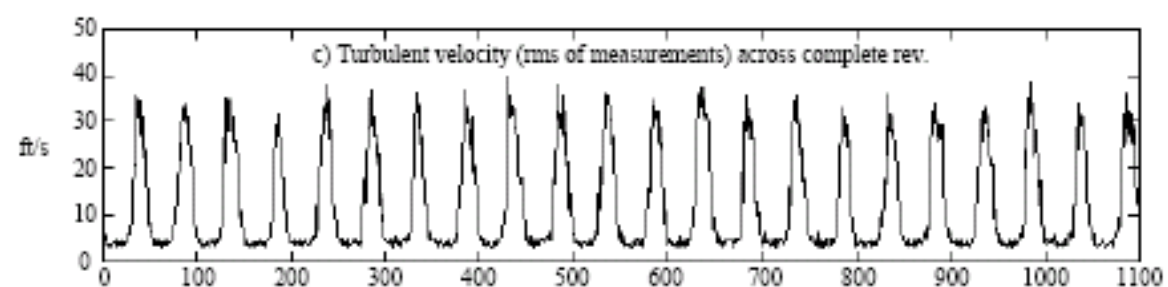
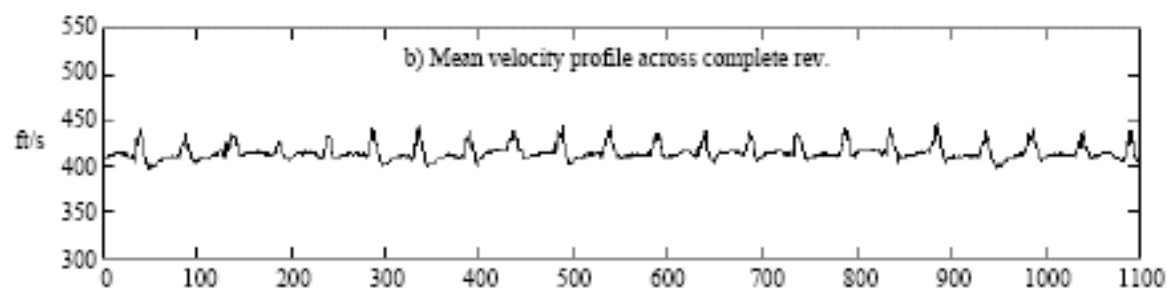
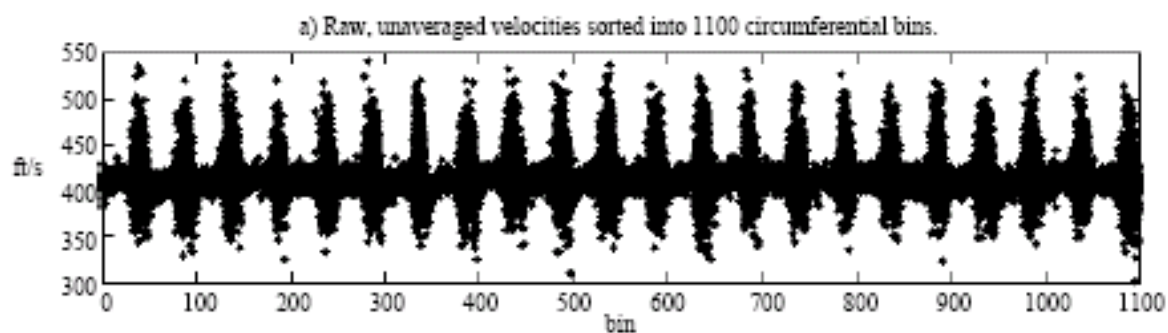
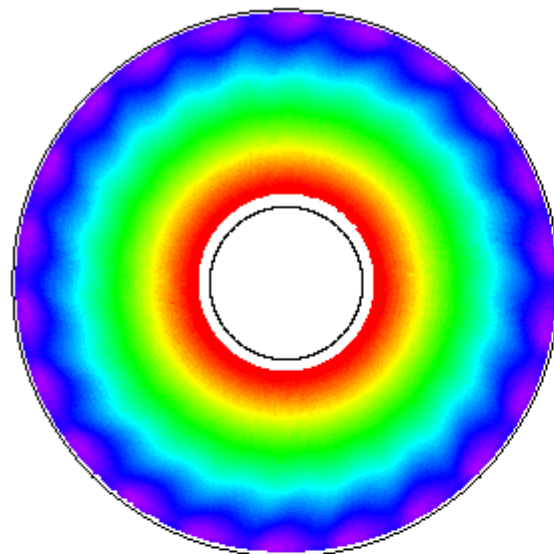
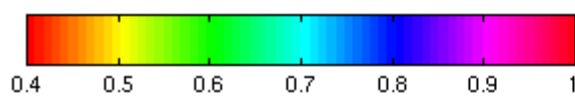
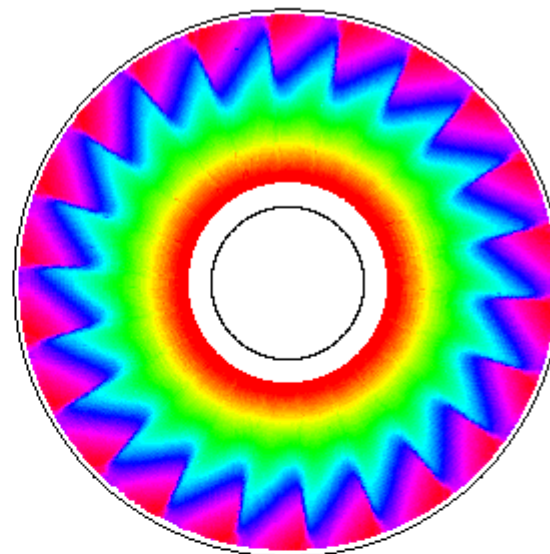
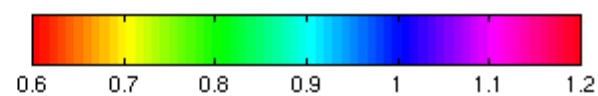


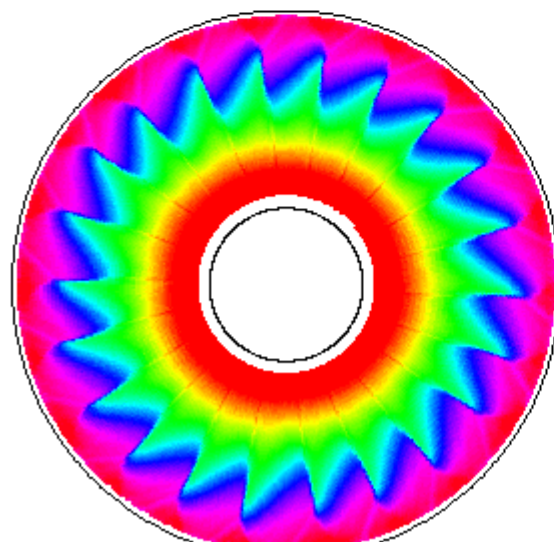
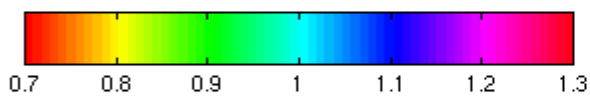
Figure 8.—Mean relative Mach number contours measured upstream of the forward-swept fan at axial station 1 at three different rotor speeds.



a) low-speed, $M_{rel \text{ tip}} = 0.817$



b) mid-speed, $M_{rel \text{ tip}} = 1.074$



c) high-speed, $M_{rel \text{ tip}} = 1.19$

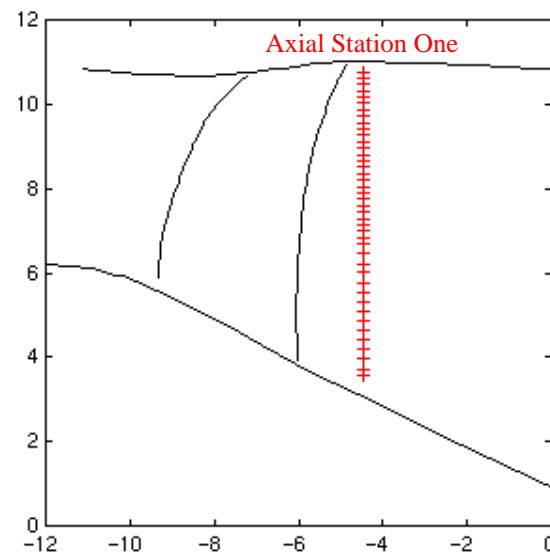
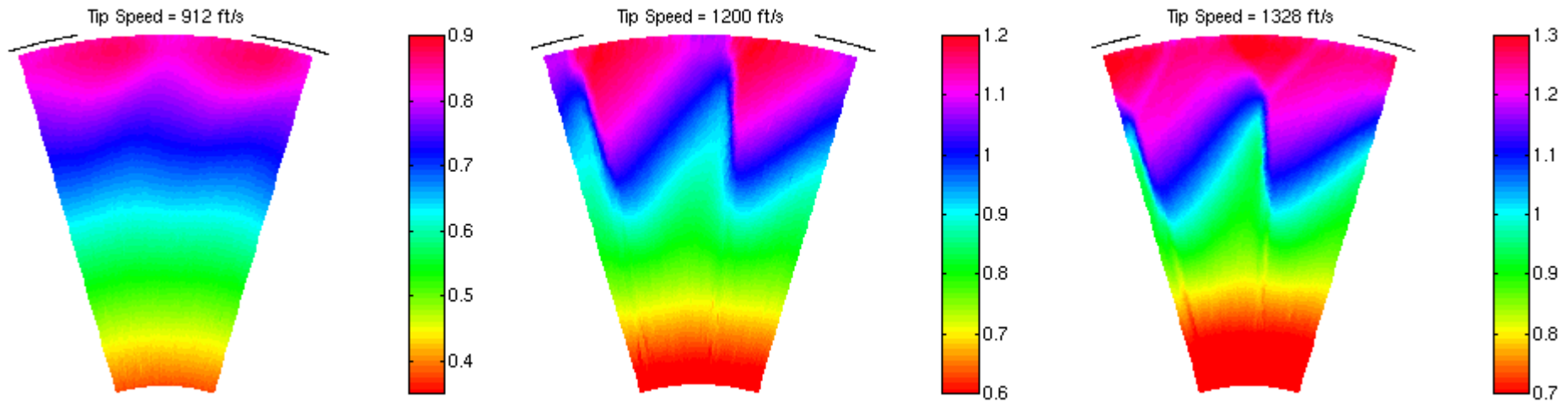


Figure 9.—Photograph of forward-swept fan after LDV test in which the rotor was operated at the high-speed condition (13,830 RPMC, 1328 ft/s tip speed, 1.19 tip Mrel.) The photo shows the build-up of LDV seed particles on the suction side of the rotor blades.

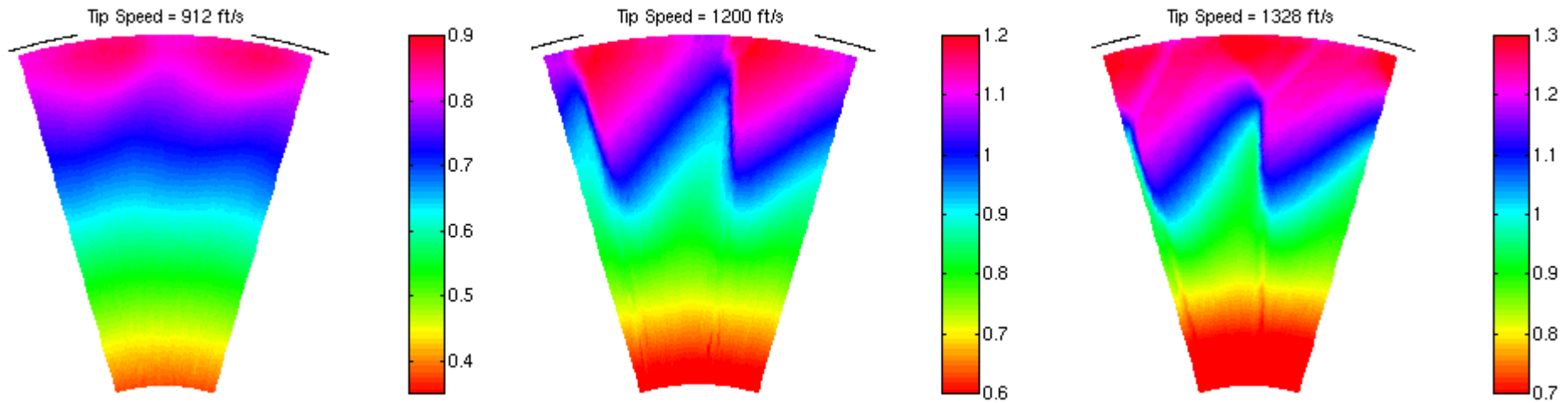


Figure 10. Slideshow (22 slides) illustrating the blade-to-blade variations in the flow measured upstream of the forward-swept fan at axial station 1 at all three test speeds. On each successive slide a new blade passage of data is rotated into view.

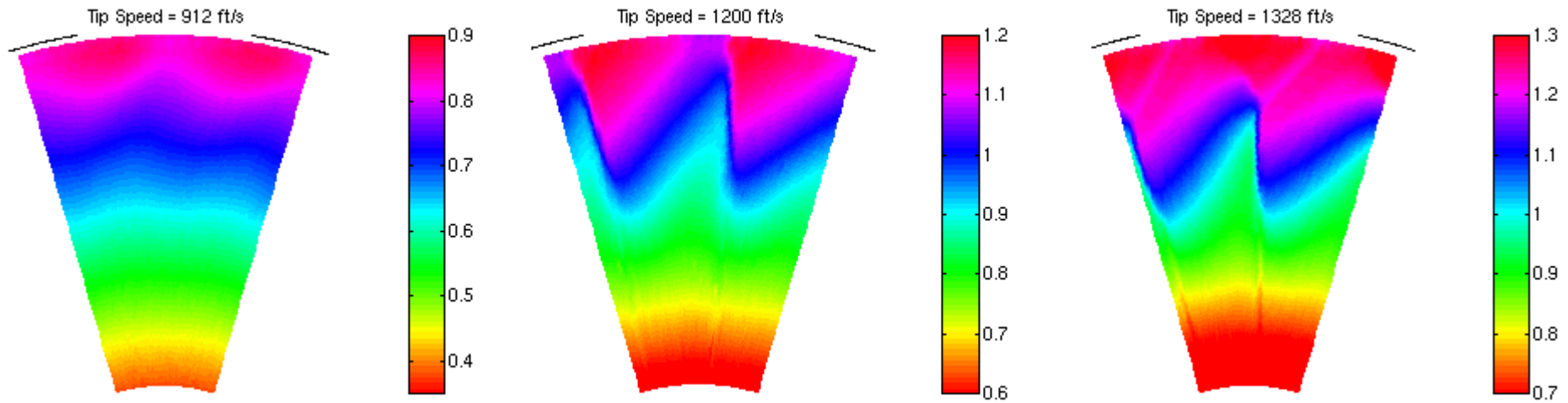
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



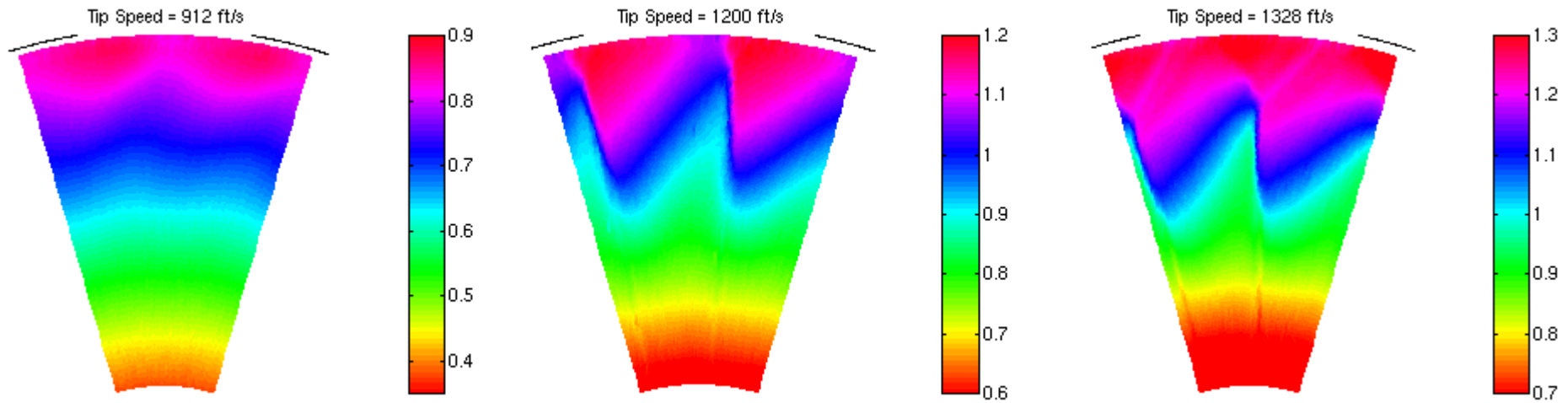
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



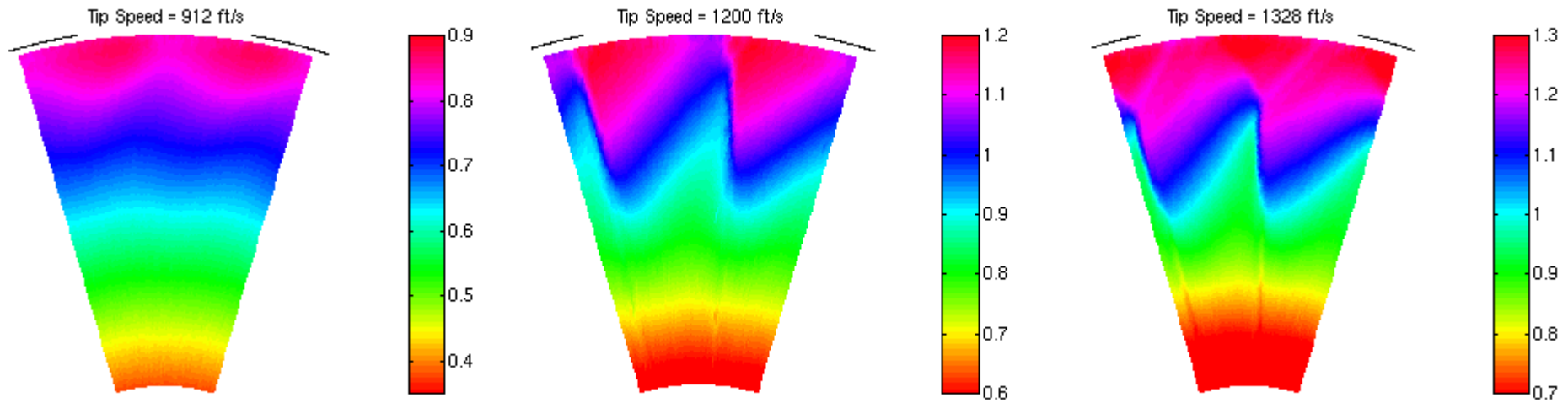
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



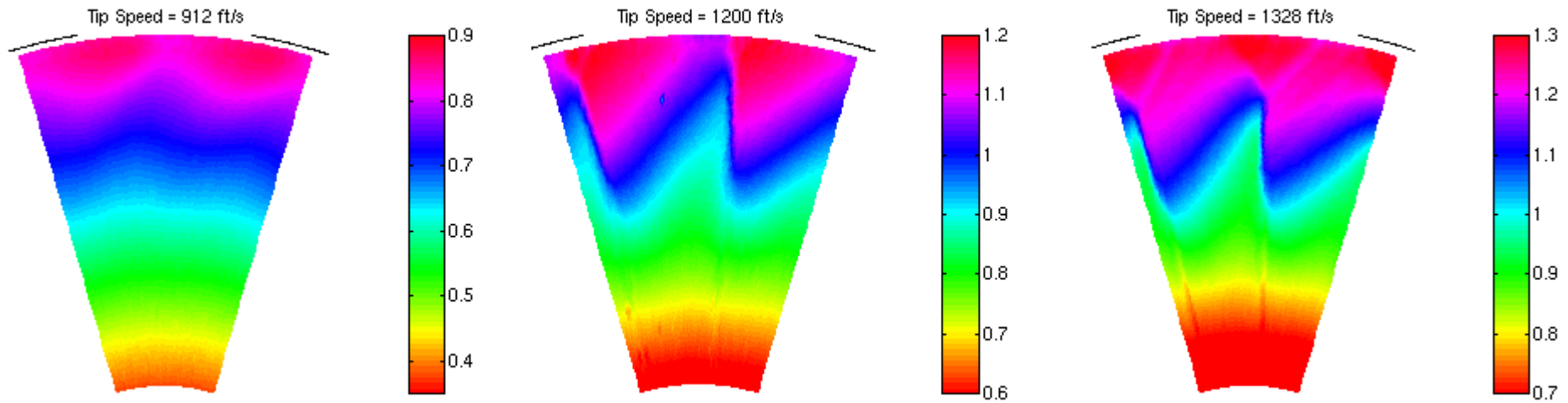
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



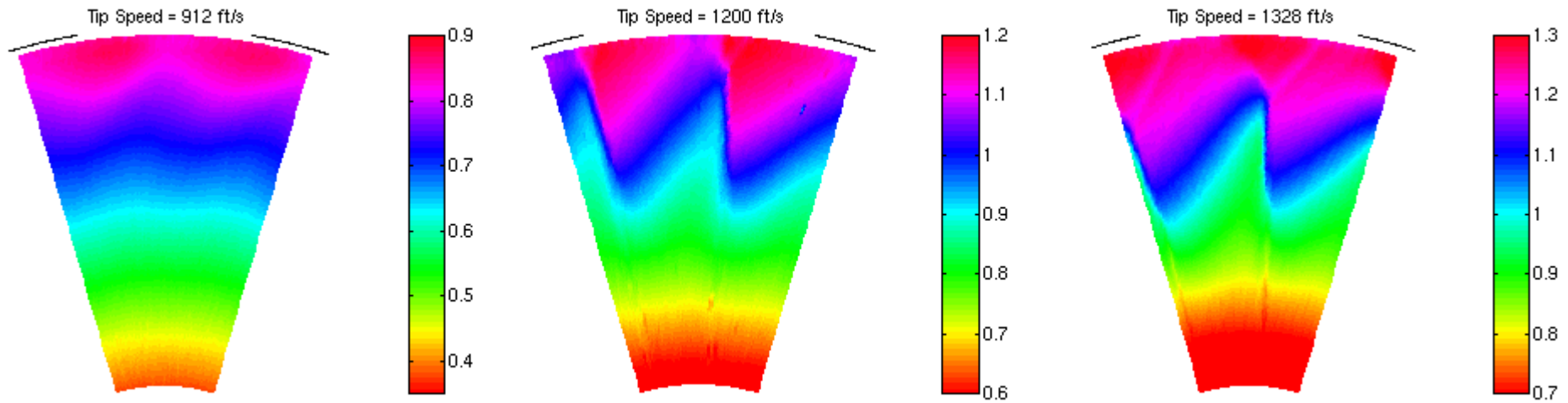
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



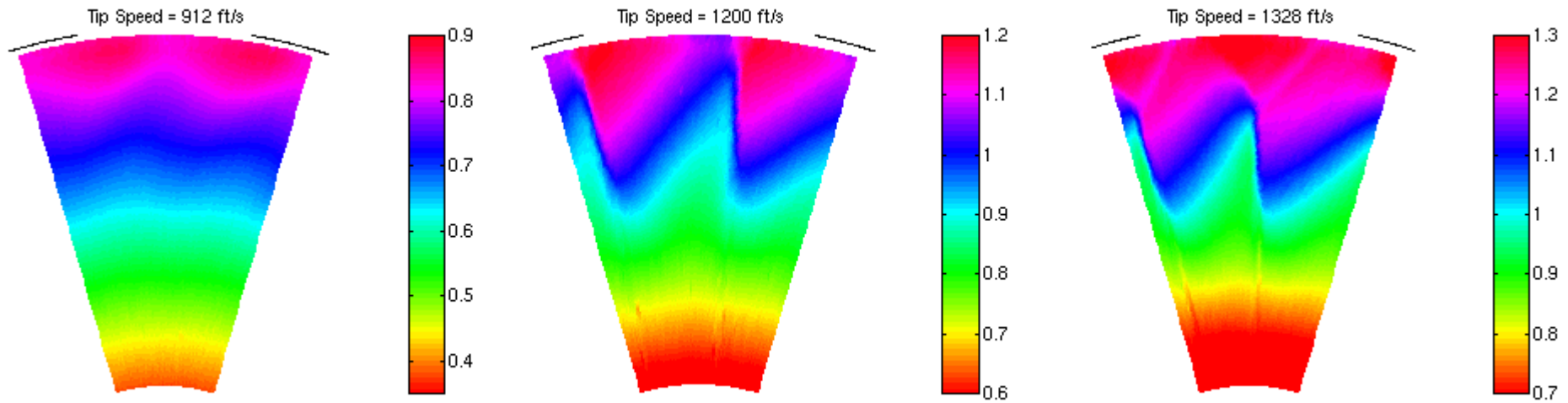
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



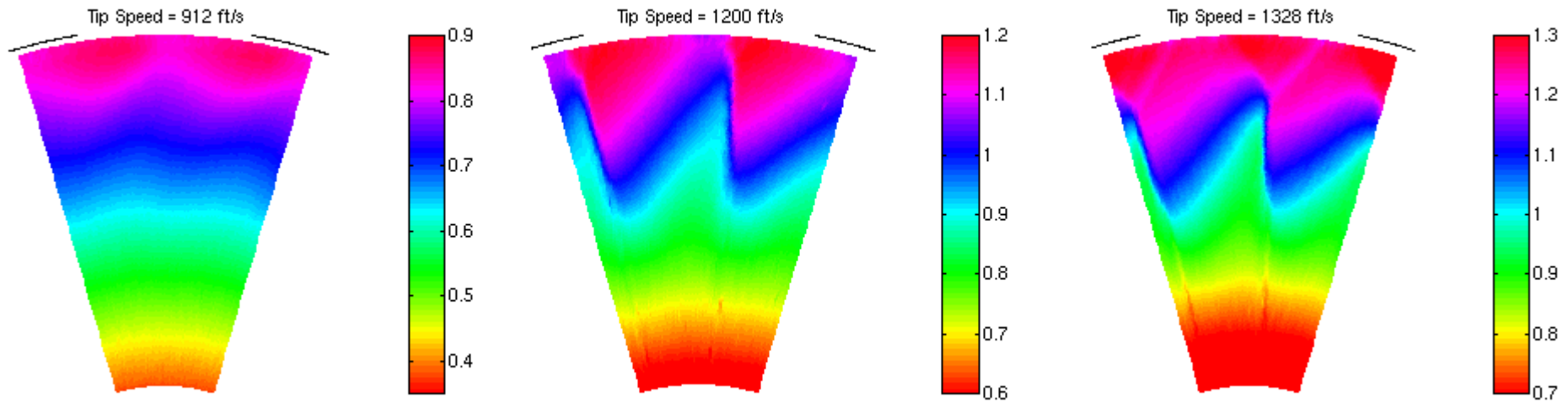
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



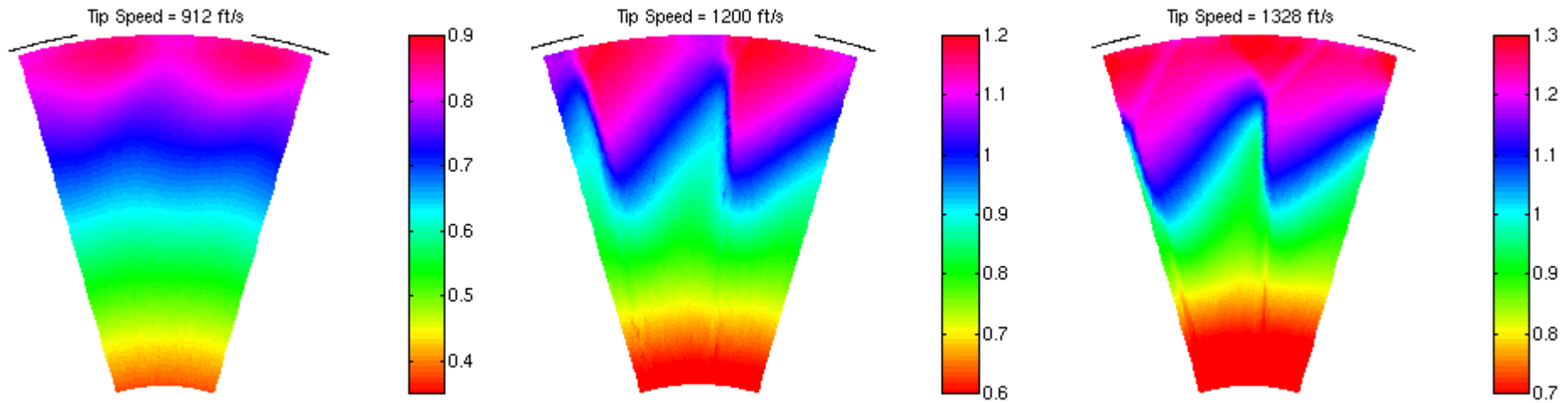
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



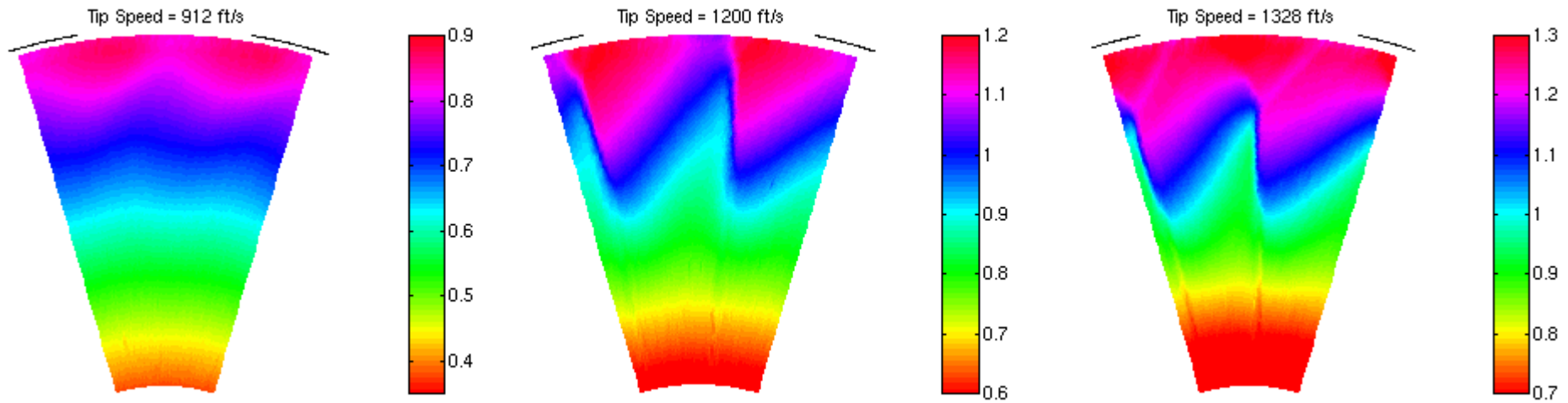
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



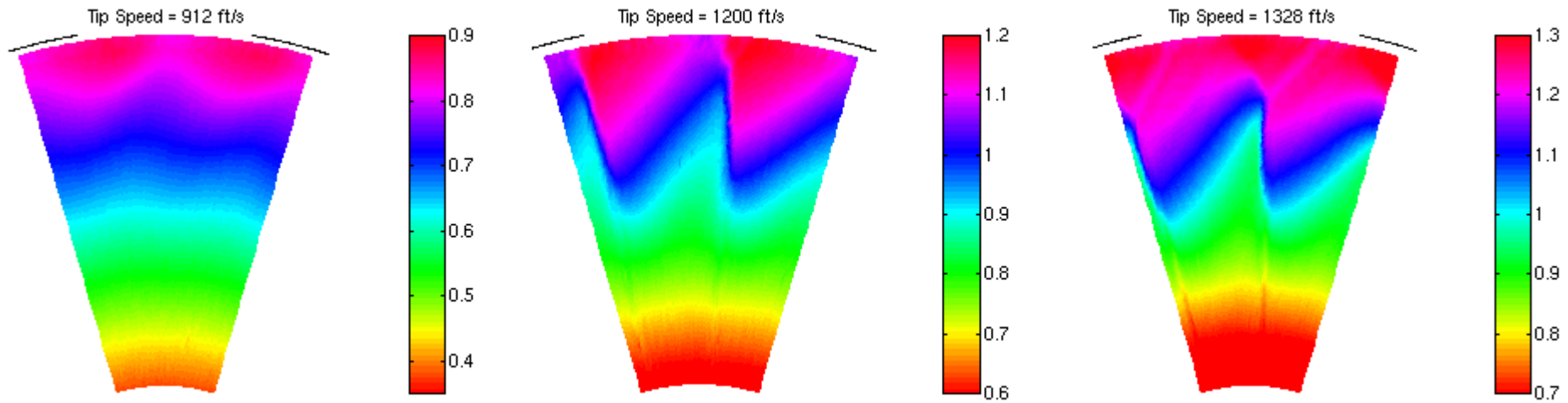
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



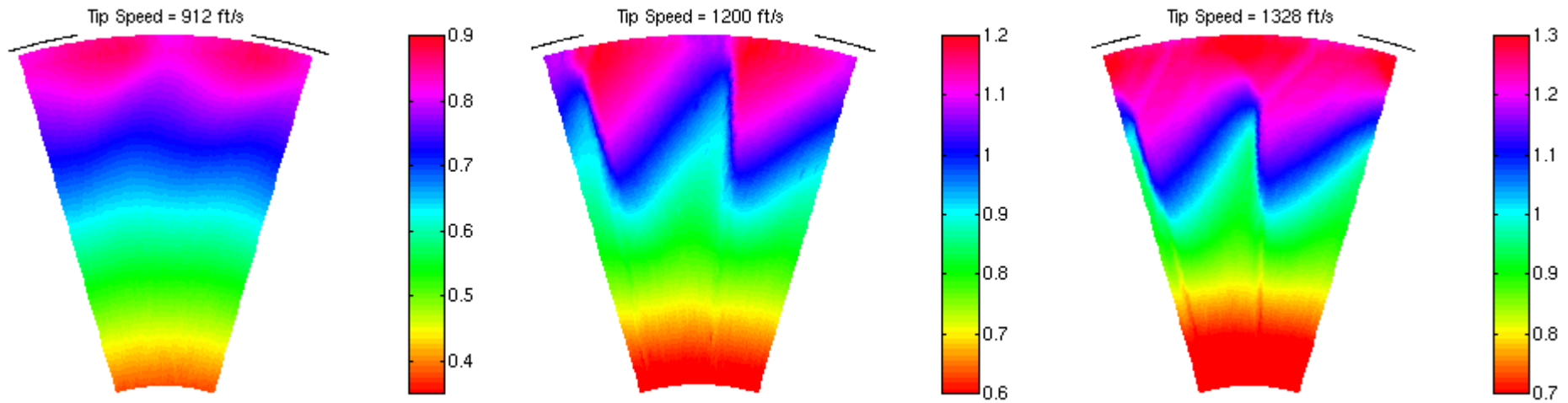
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



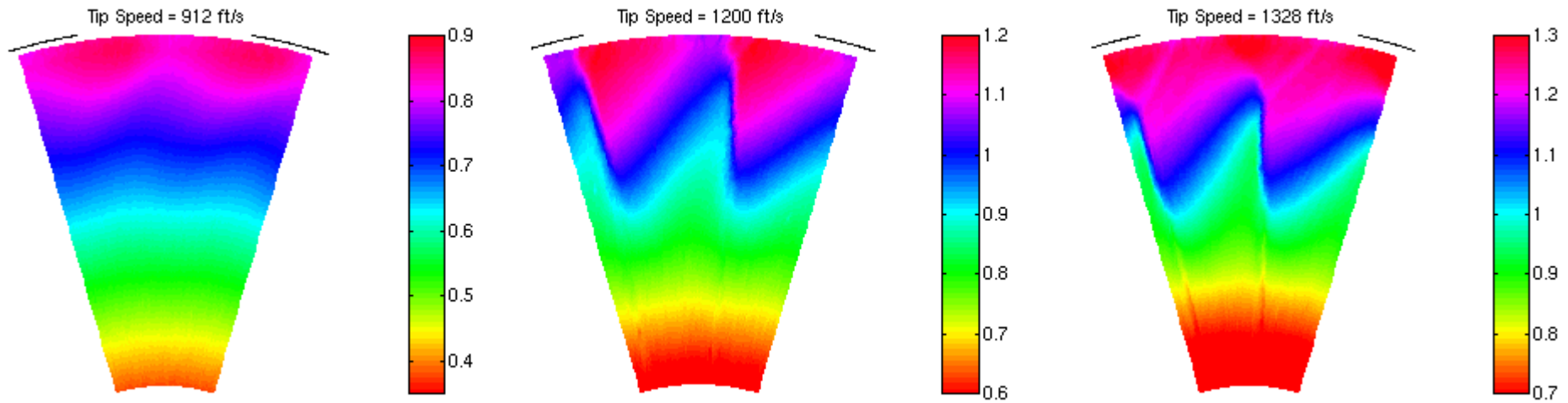
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



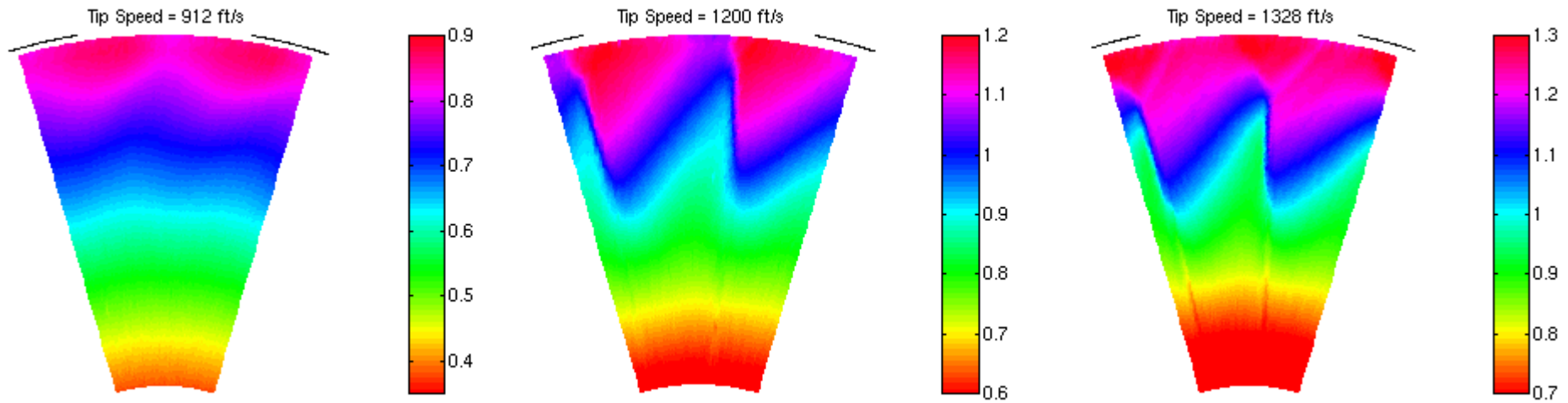
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



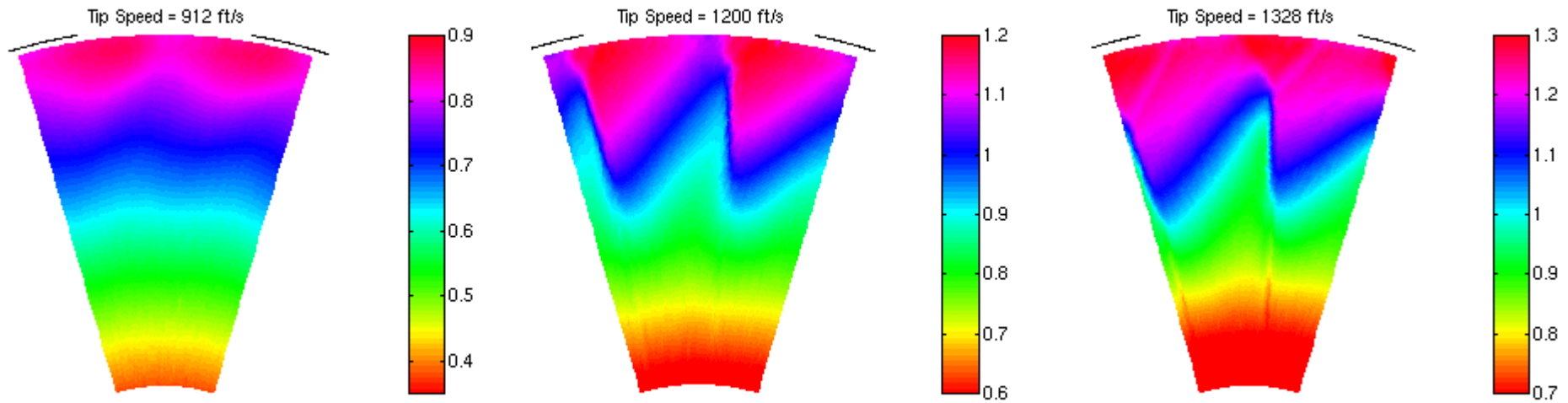
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



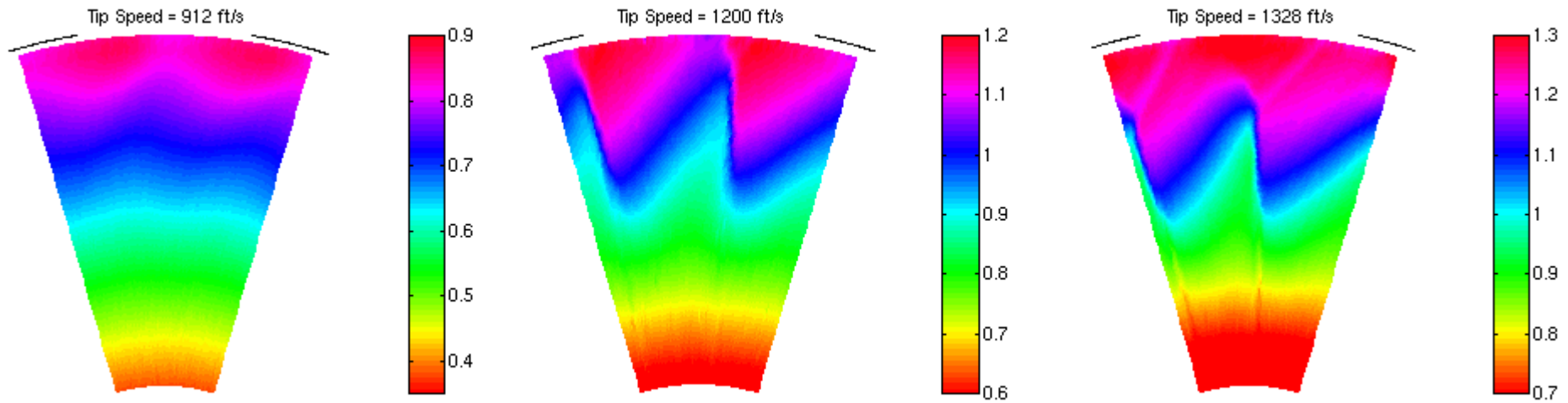
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



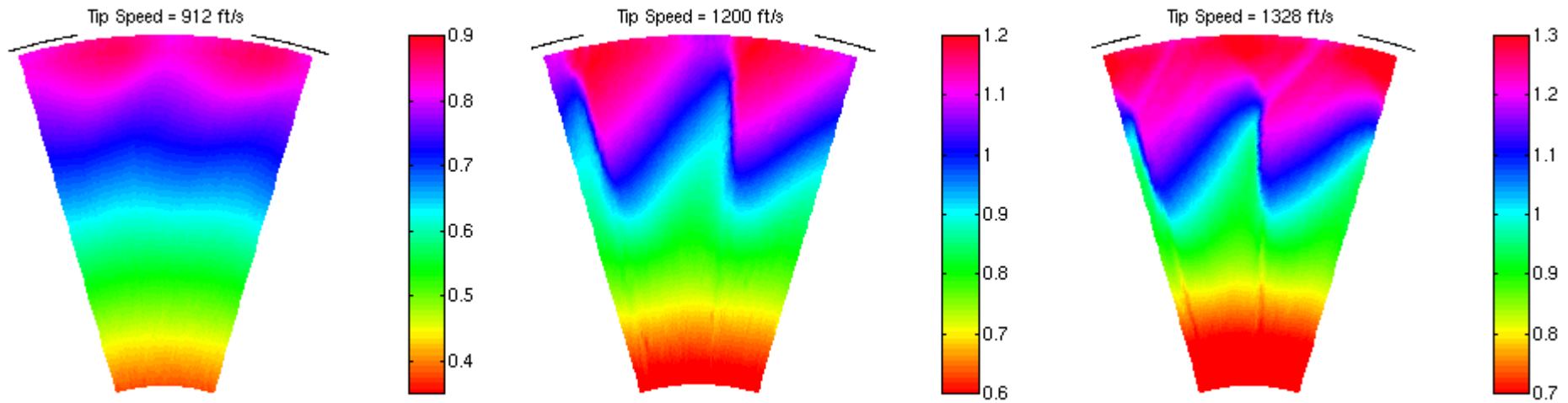
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



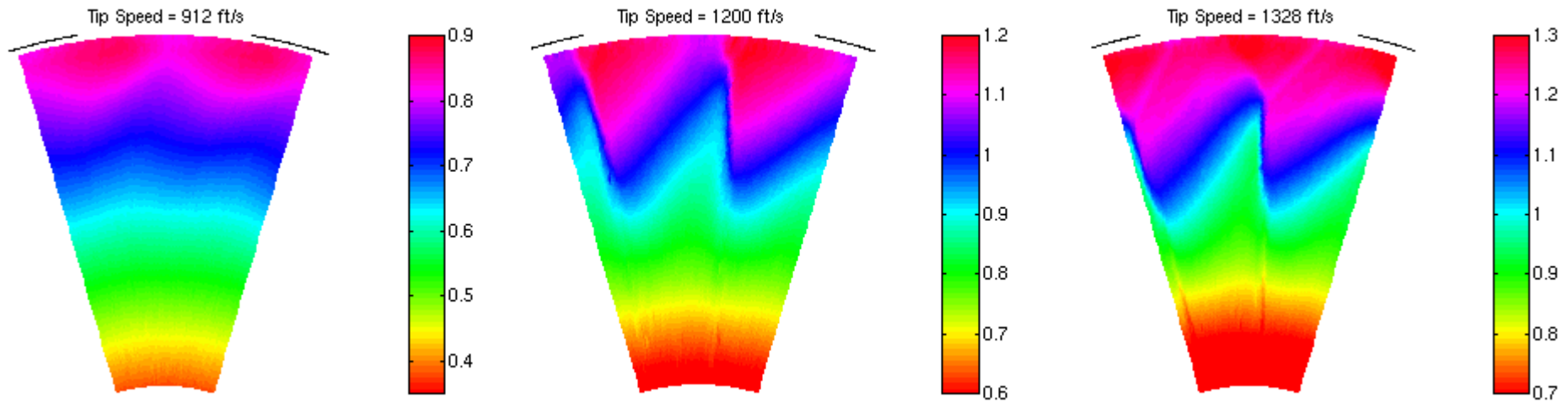
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



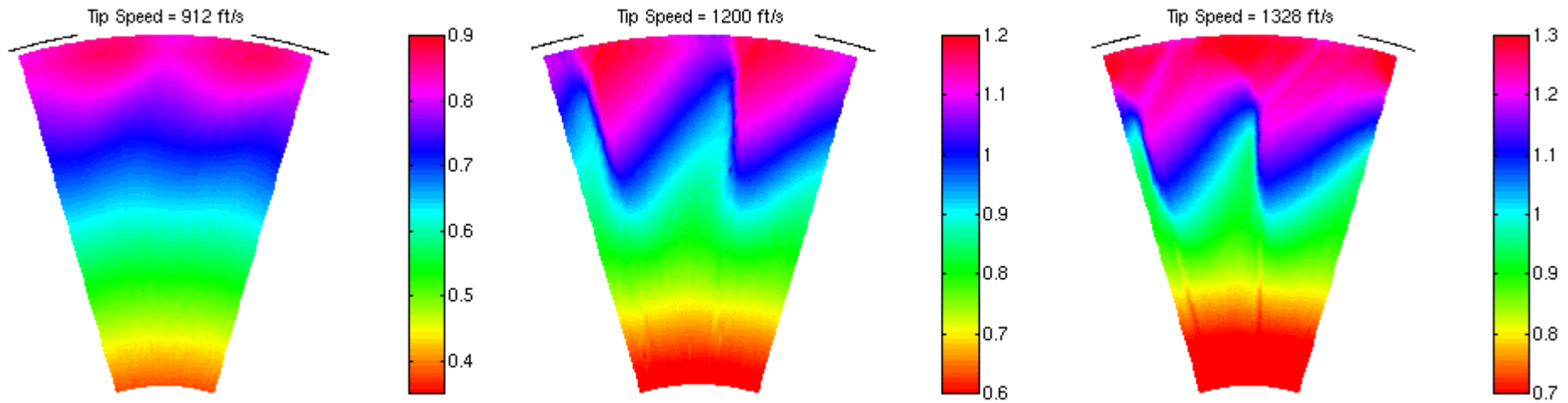
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



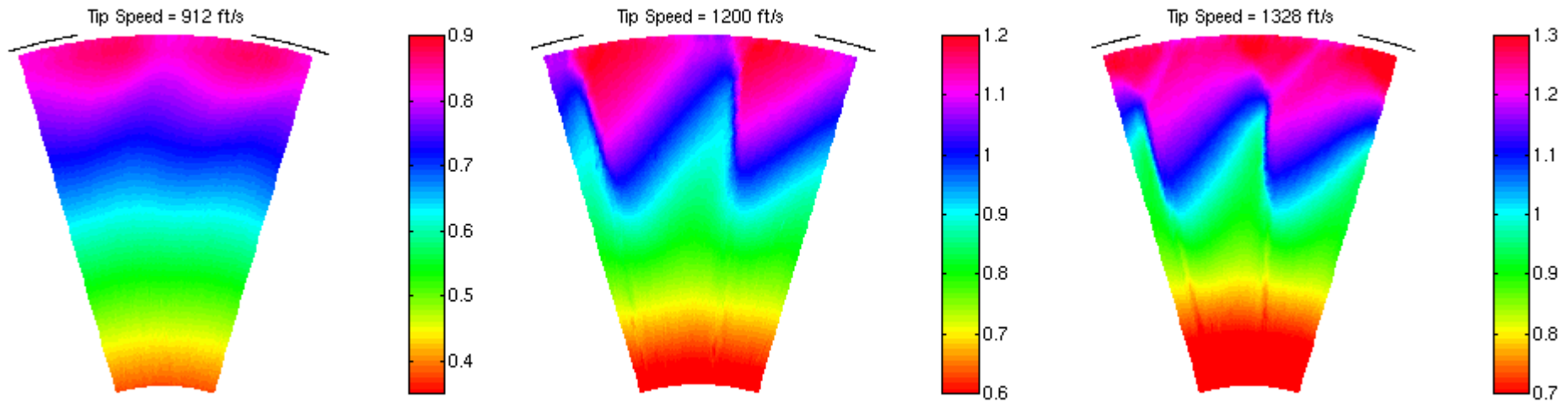
Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.



Relative Mach Number Contours Measured Upstream of Forward-Swept Rotor
Axial Station 1
 $x = -4.48$ in.

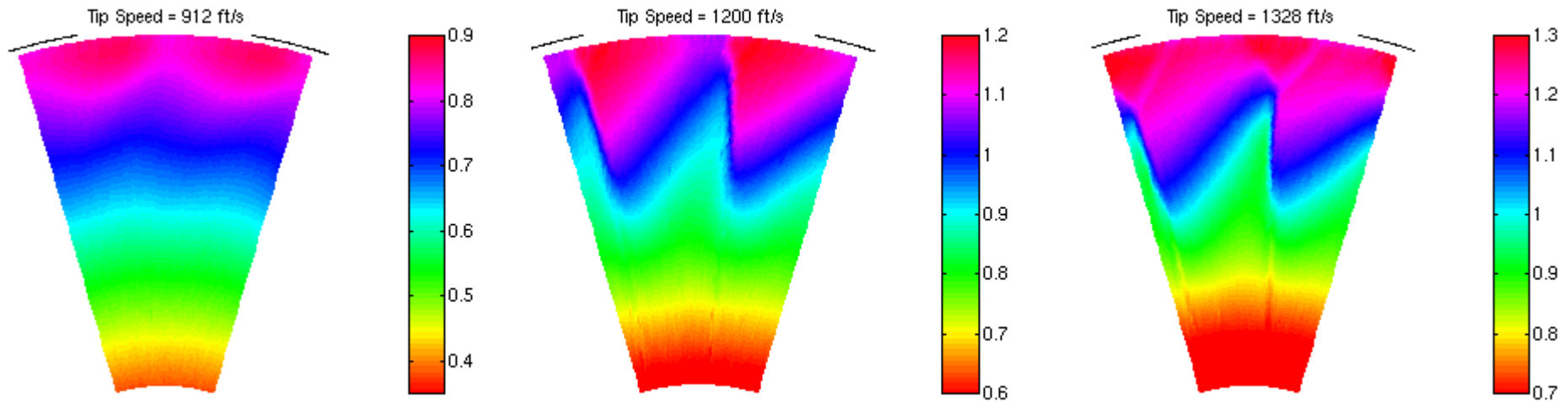
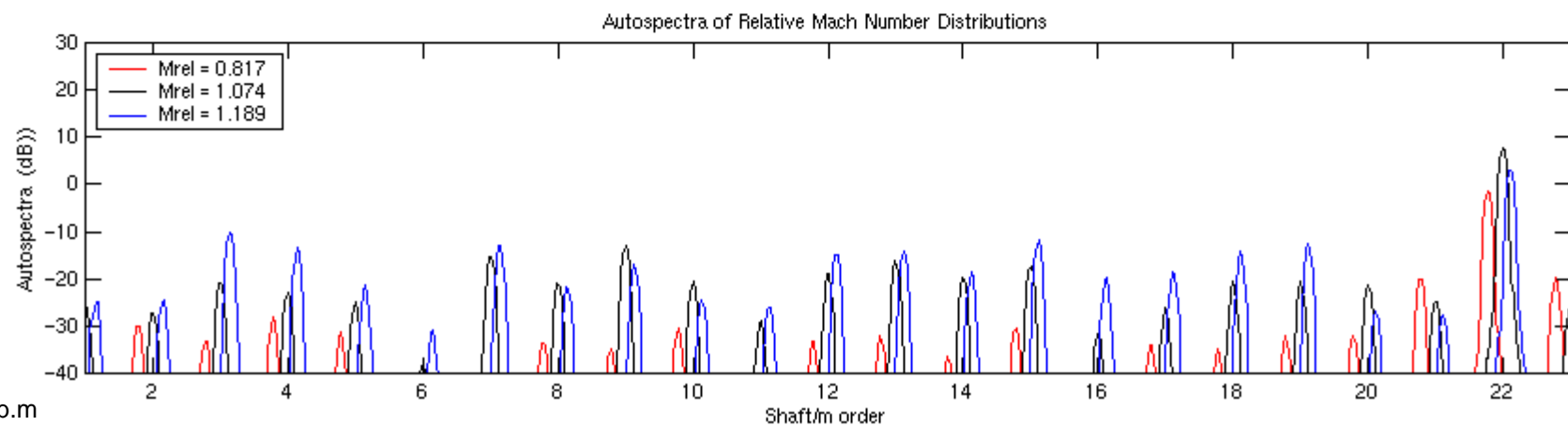
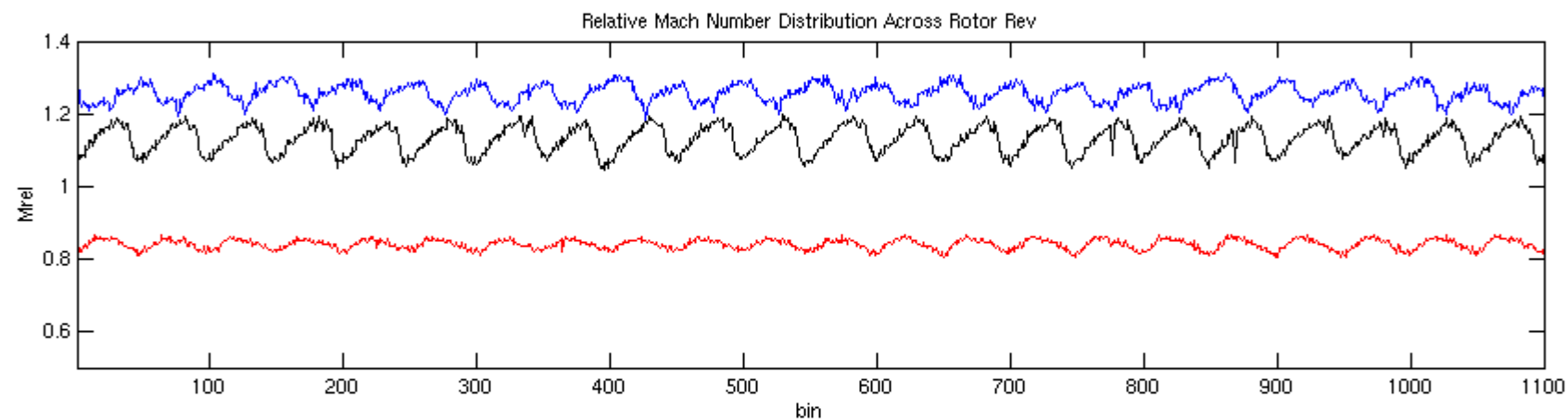
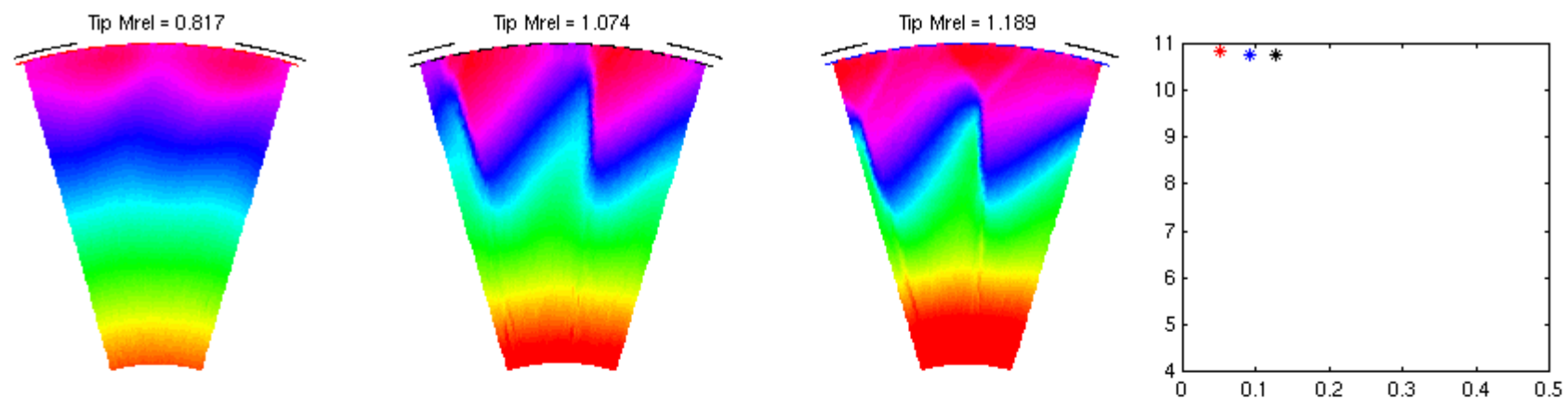
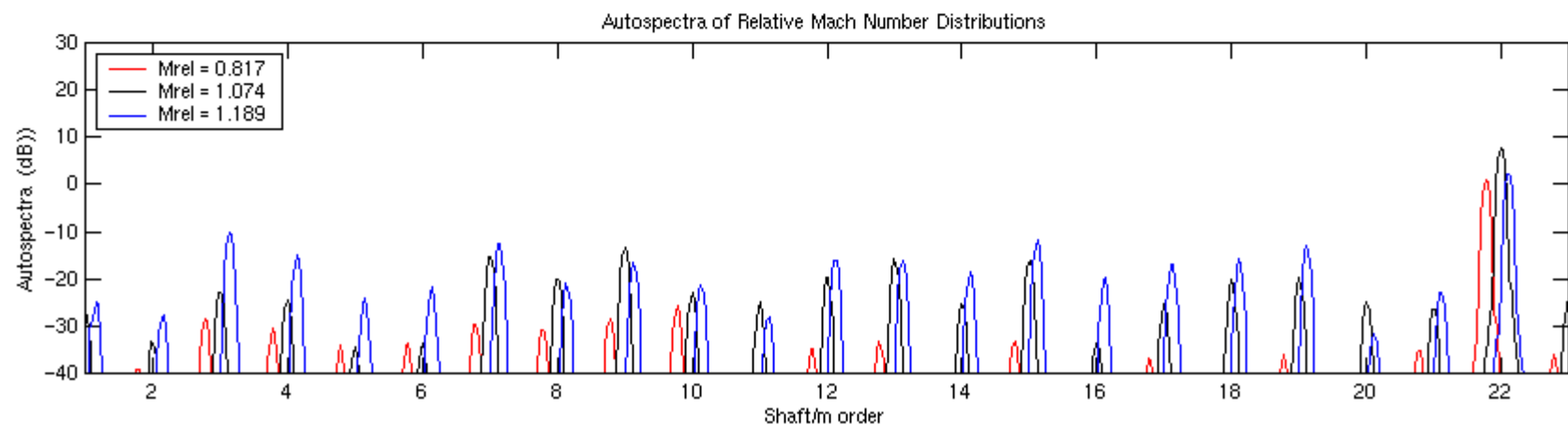
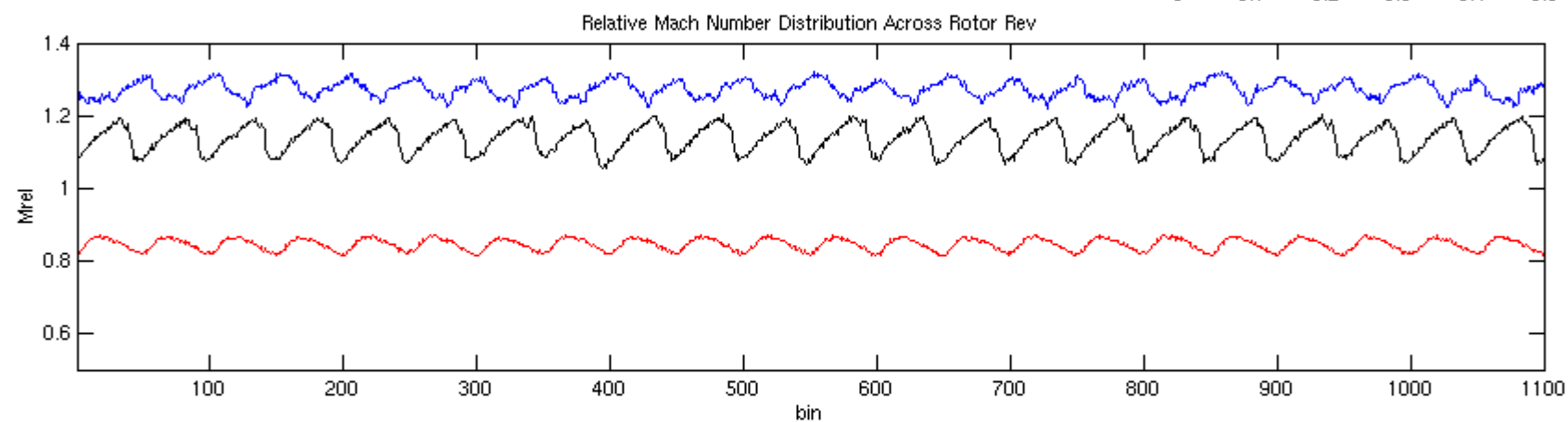
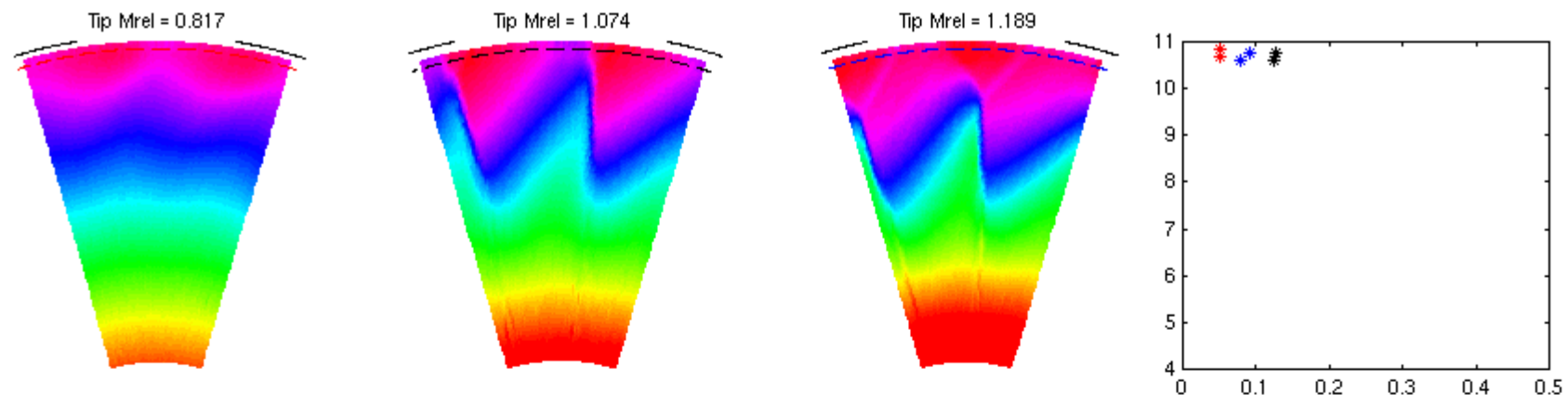
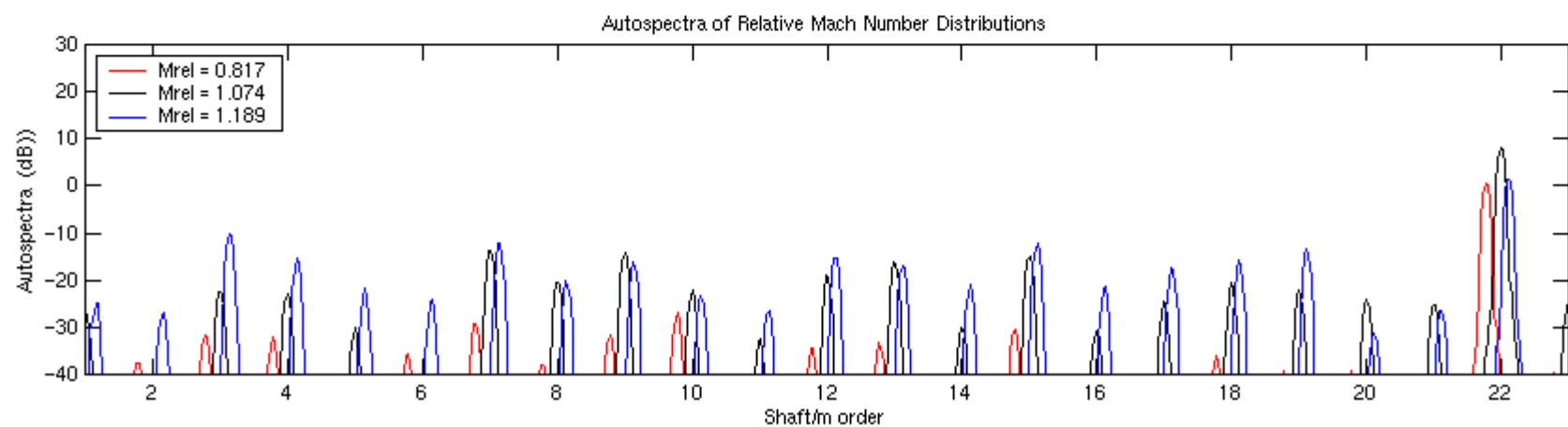
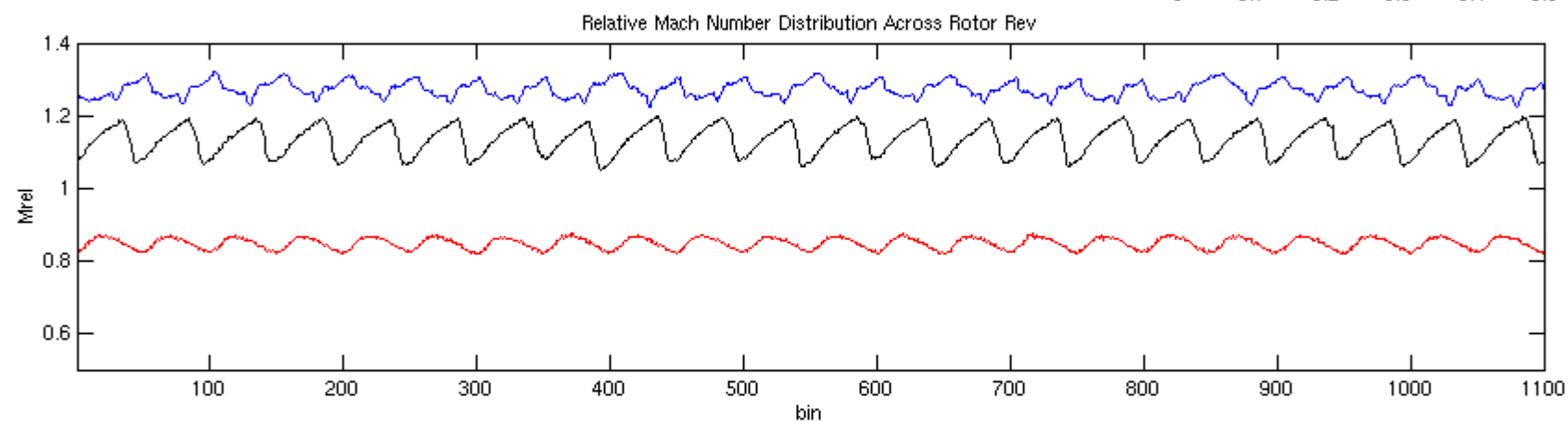
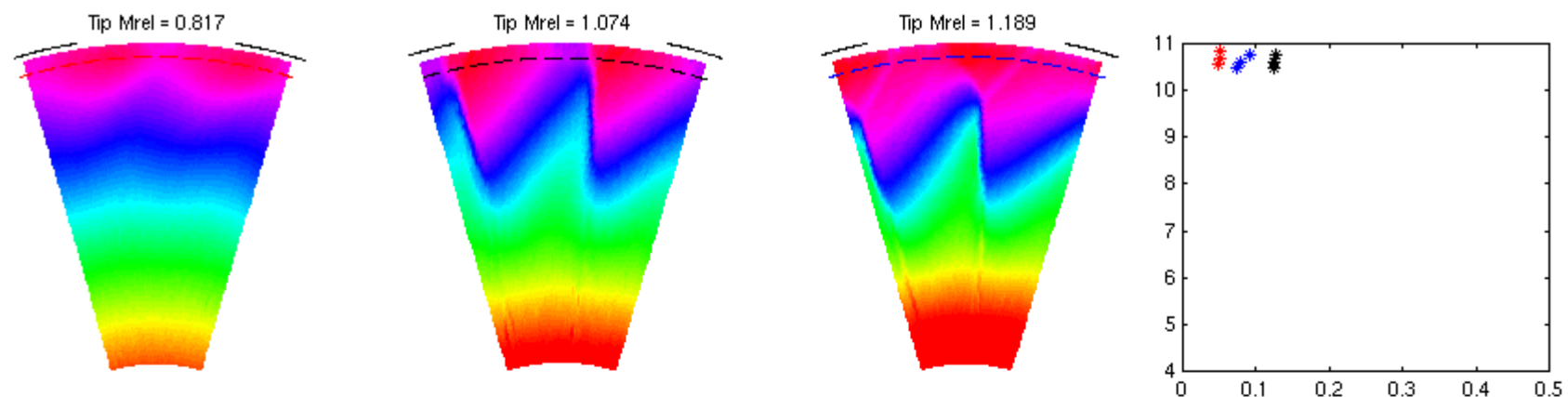
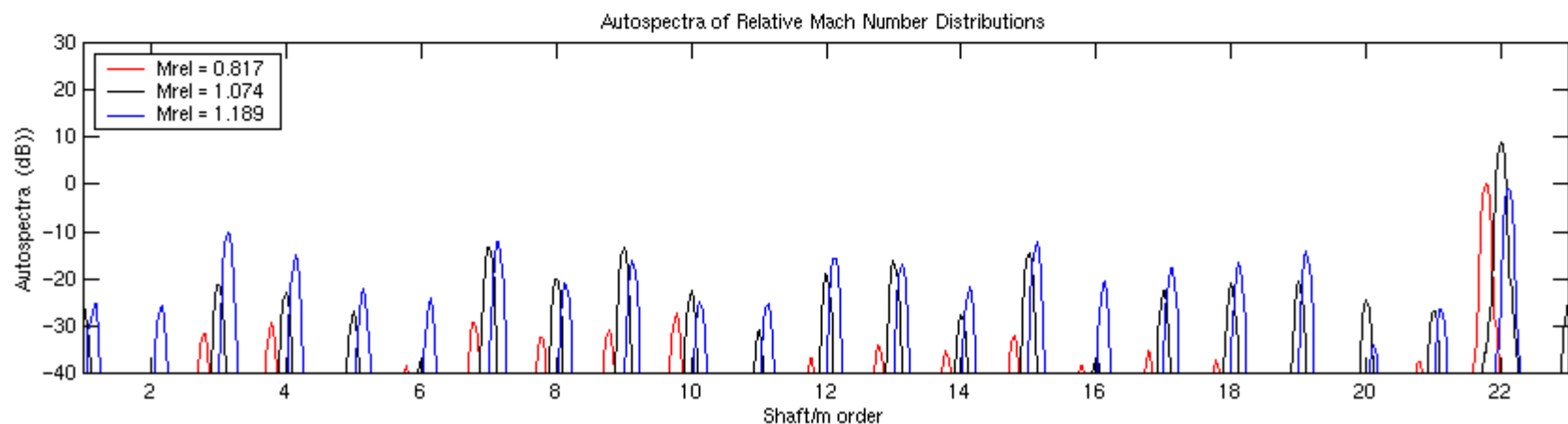
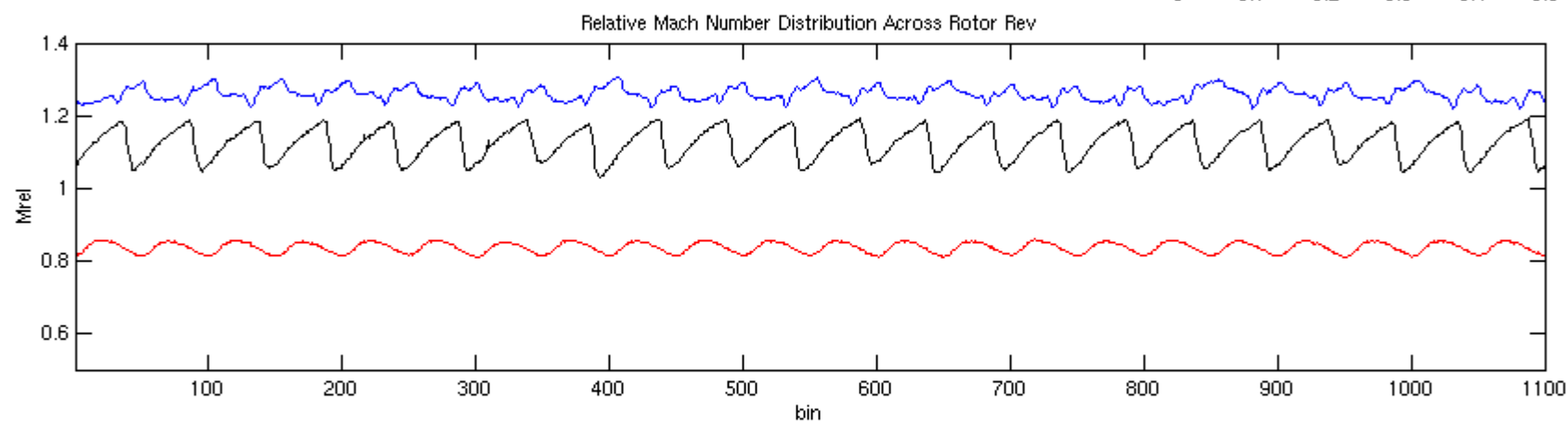
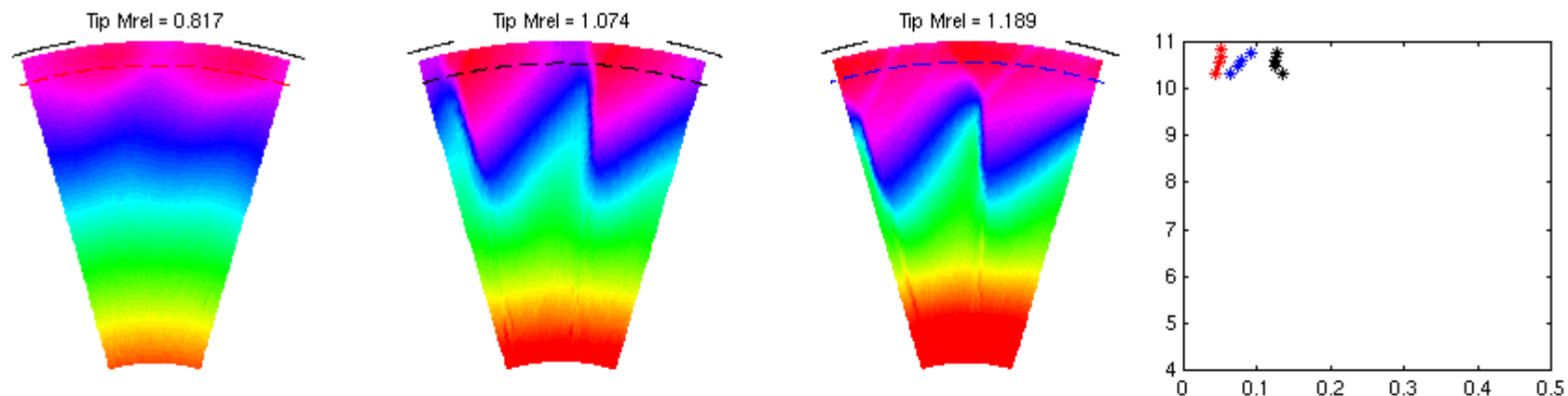


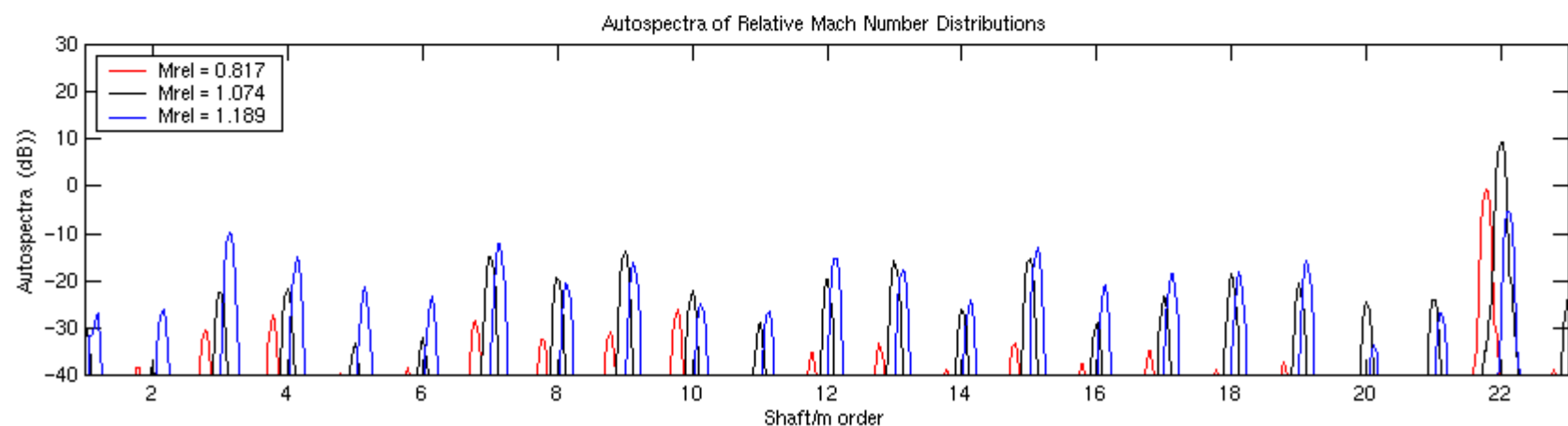
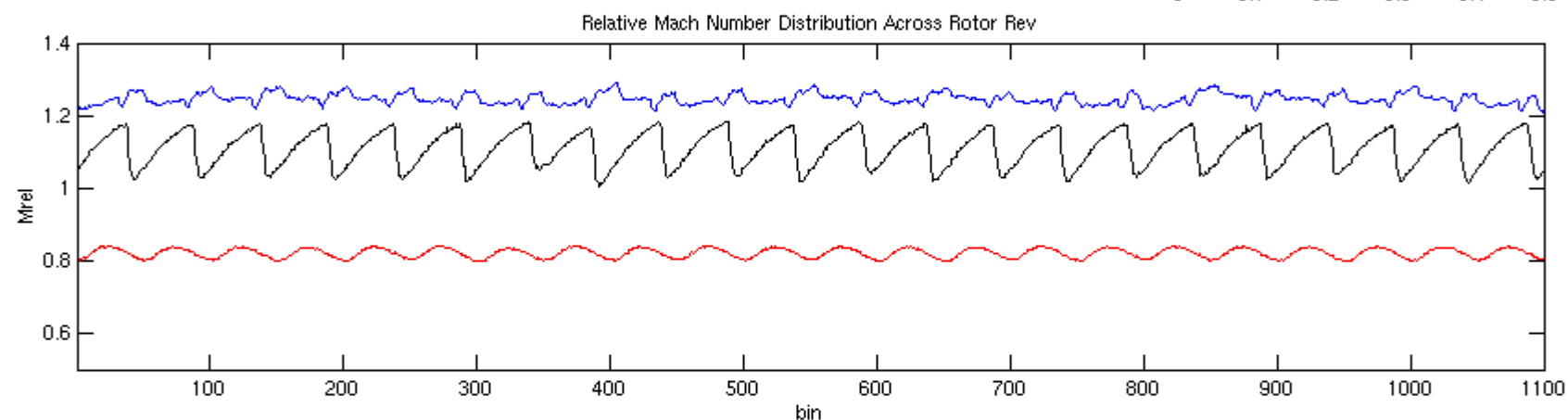
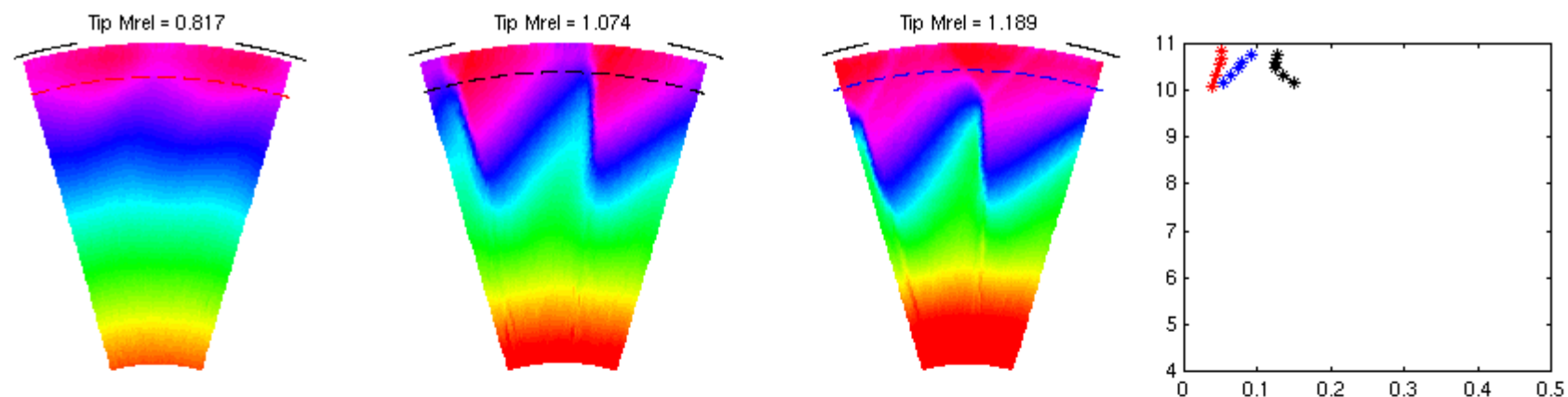
Figure 11. Slideshow (32 slides) illustrating how the perturbation in the flow measured upstream of the forward-swept fan at axial station 1 varies with radial location for each of the three tested speeds. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows autospectra computed from the relative Mach number distributions ($m = 22$ corresponds to the blade passing frequency). The plot in the upper right-hand corner shows the average amplitude of the relative Mach number distributions (plotted along the x-axis) vs. radial location (plotted along the y-axis.) The dashed lines overlaid on top of the color contour plots show the radial locations at which the data presented on that slide were acquired.

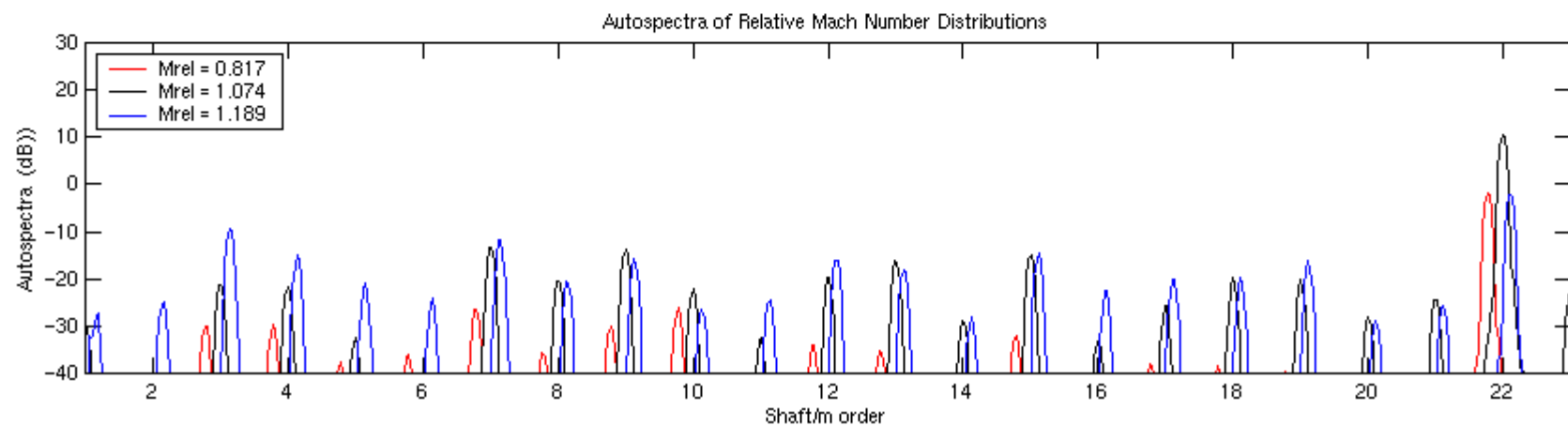
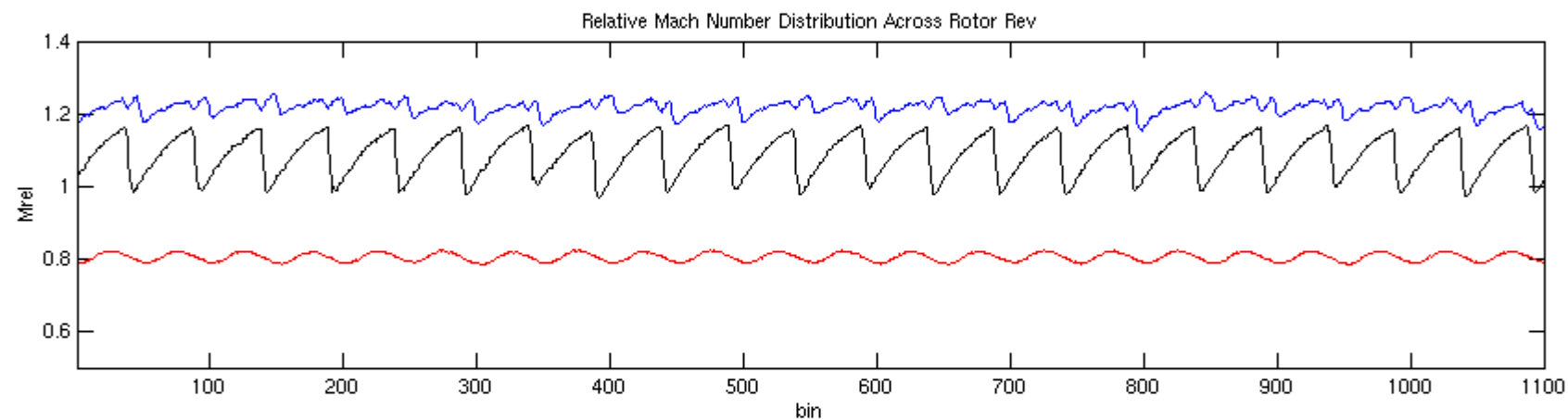
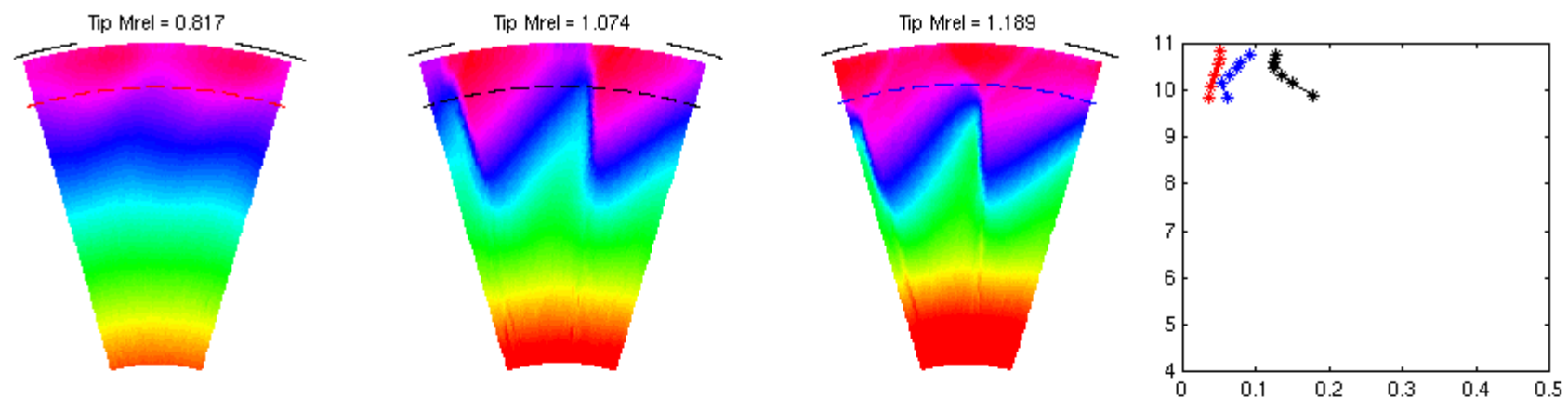


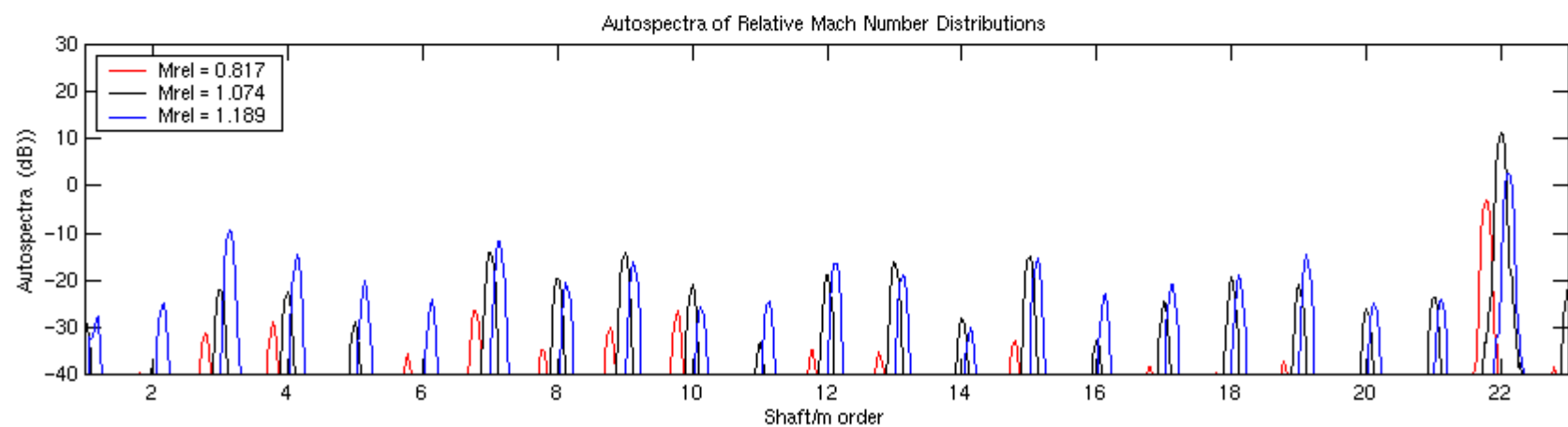
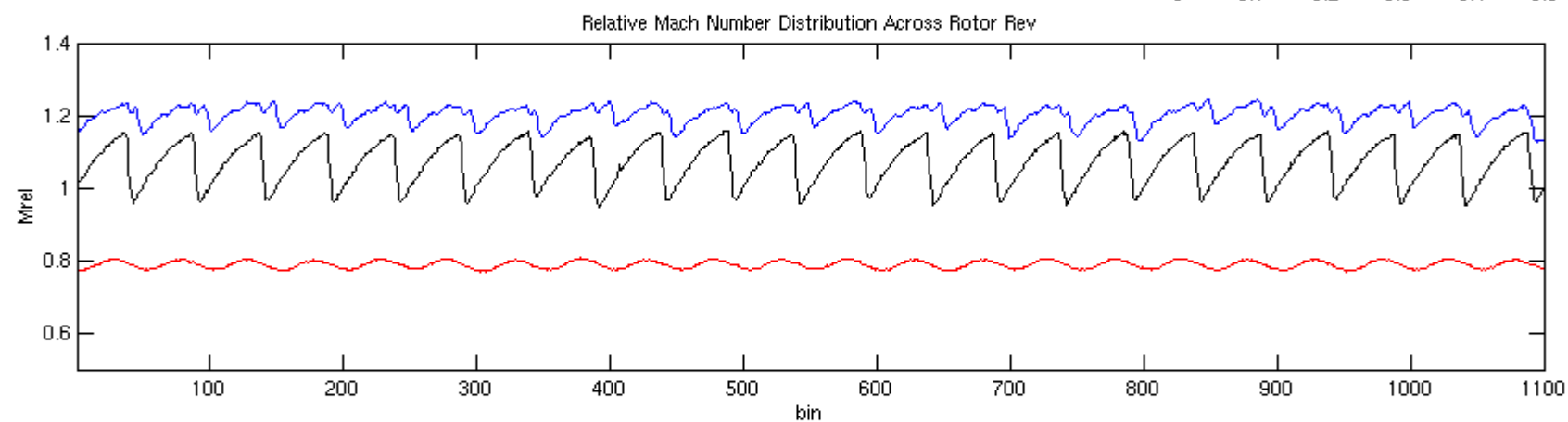
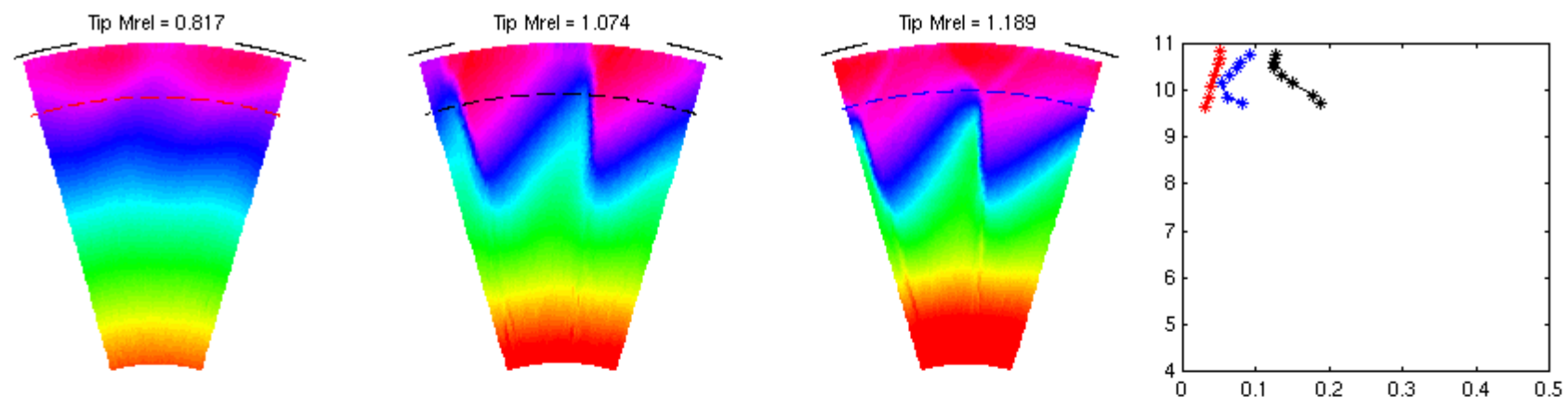


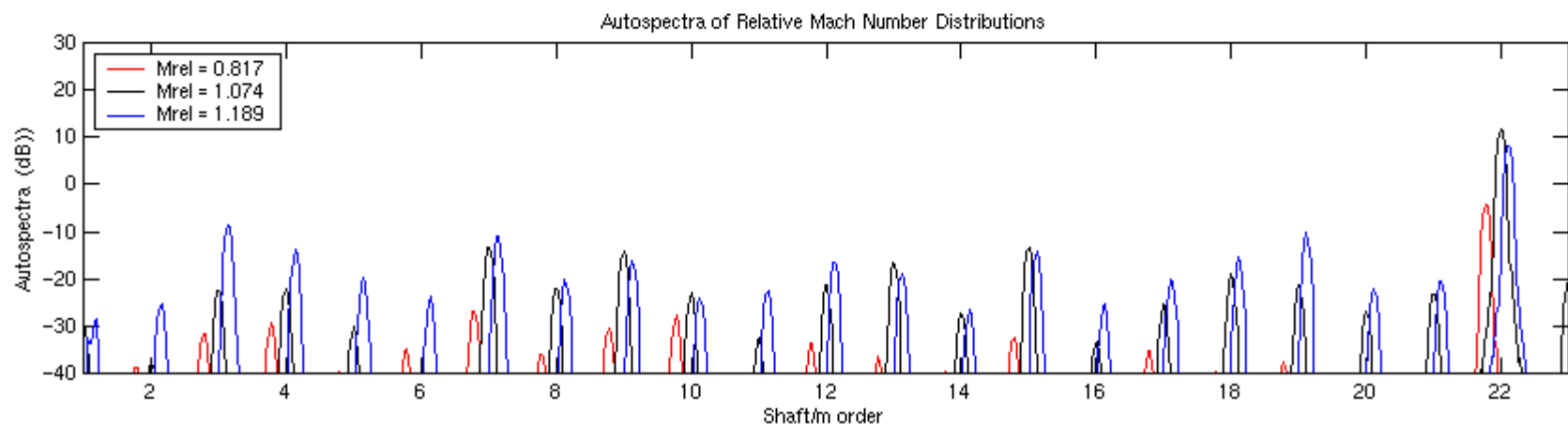
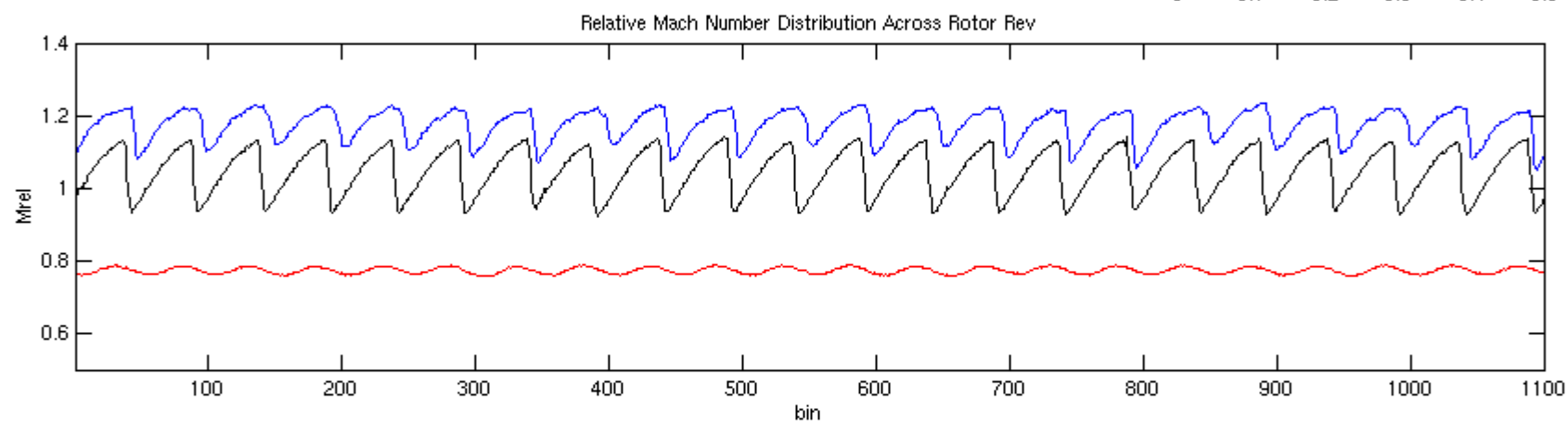
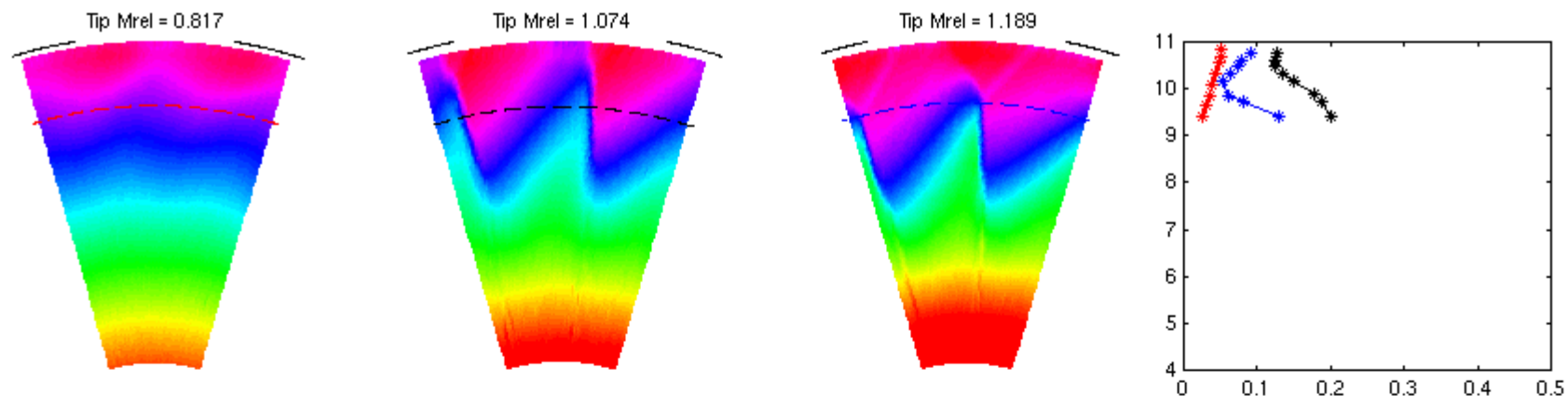


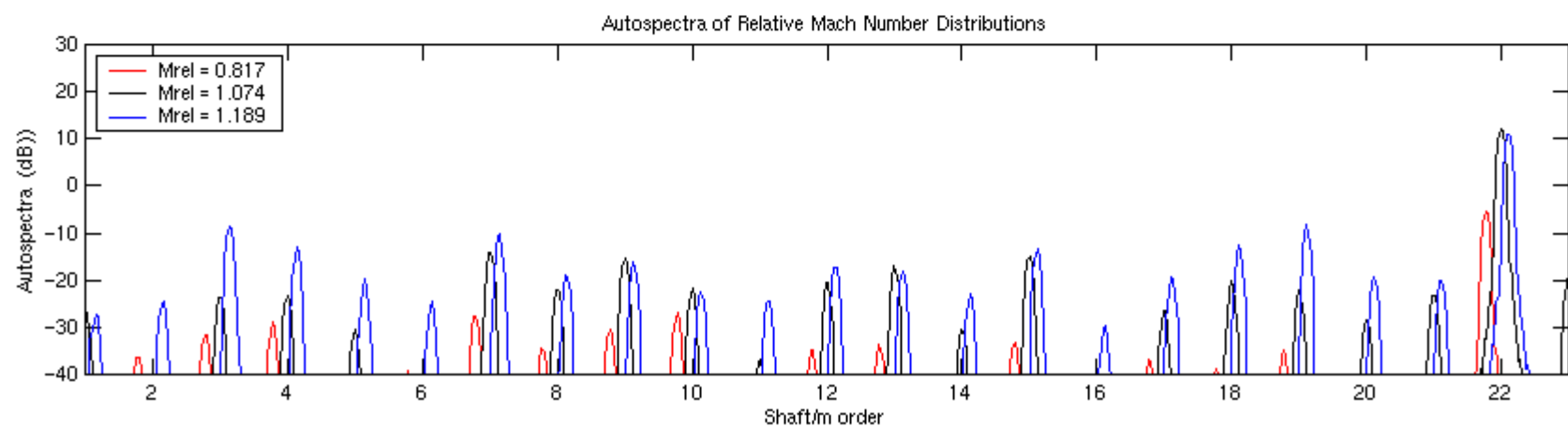
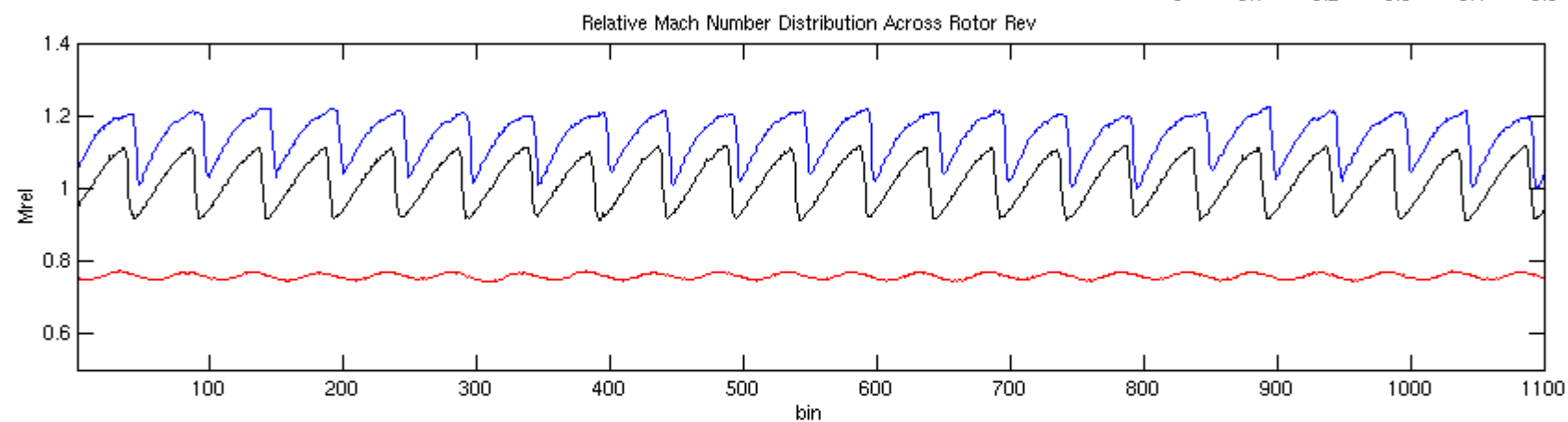
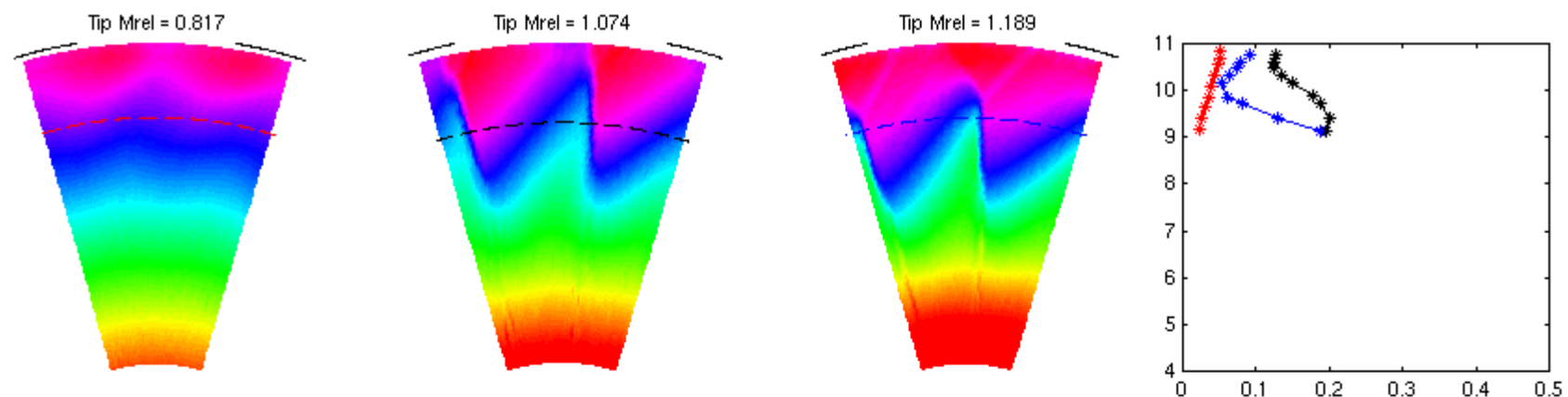


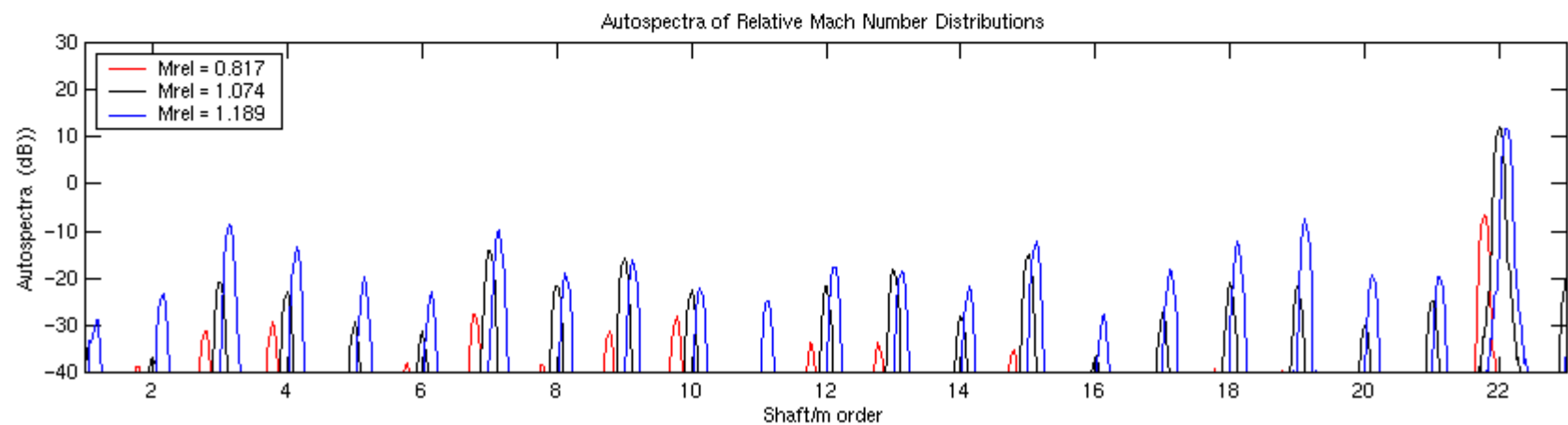
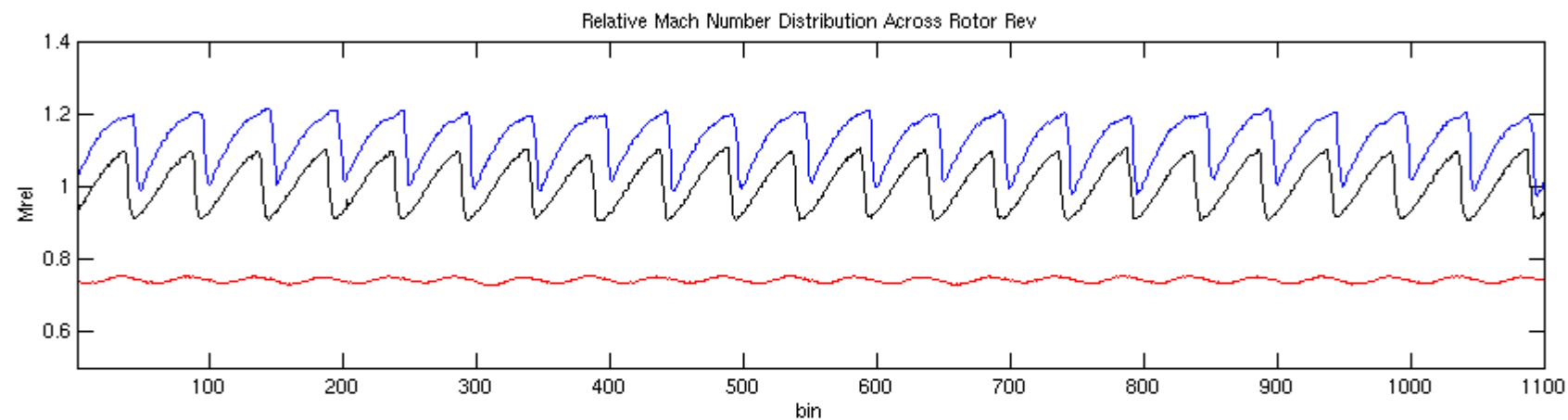
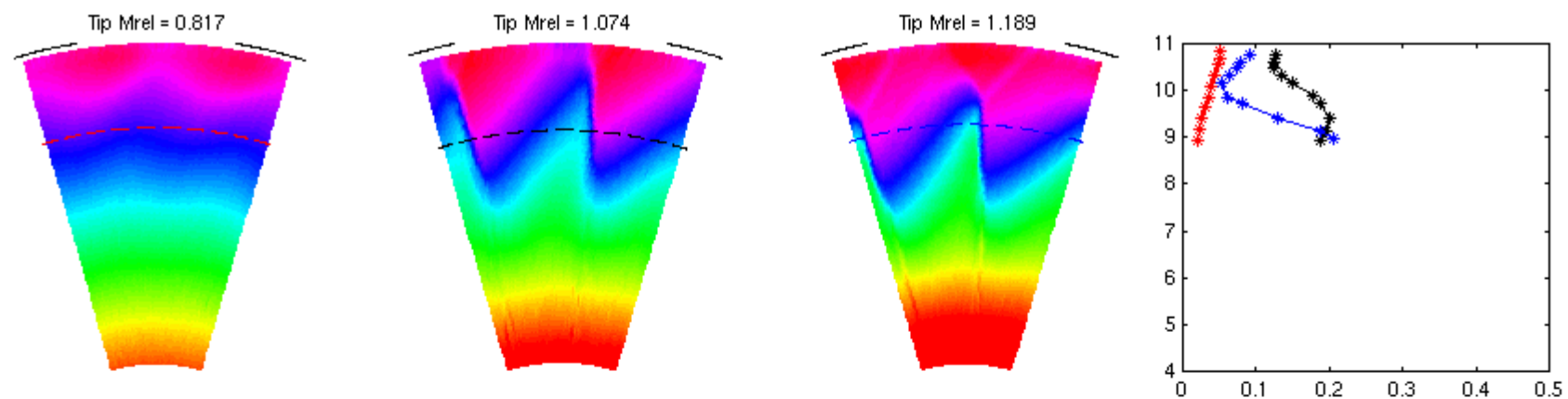


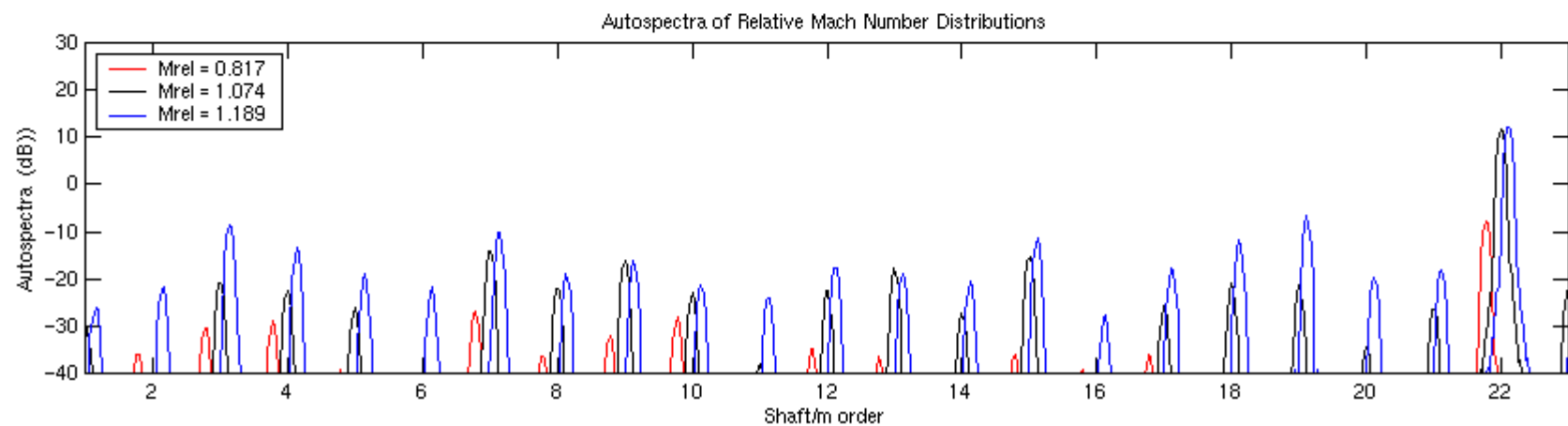
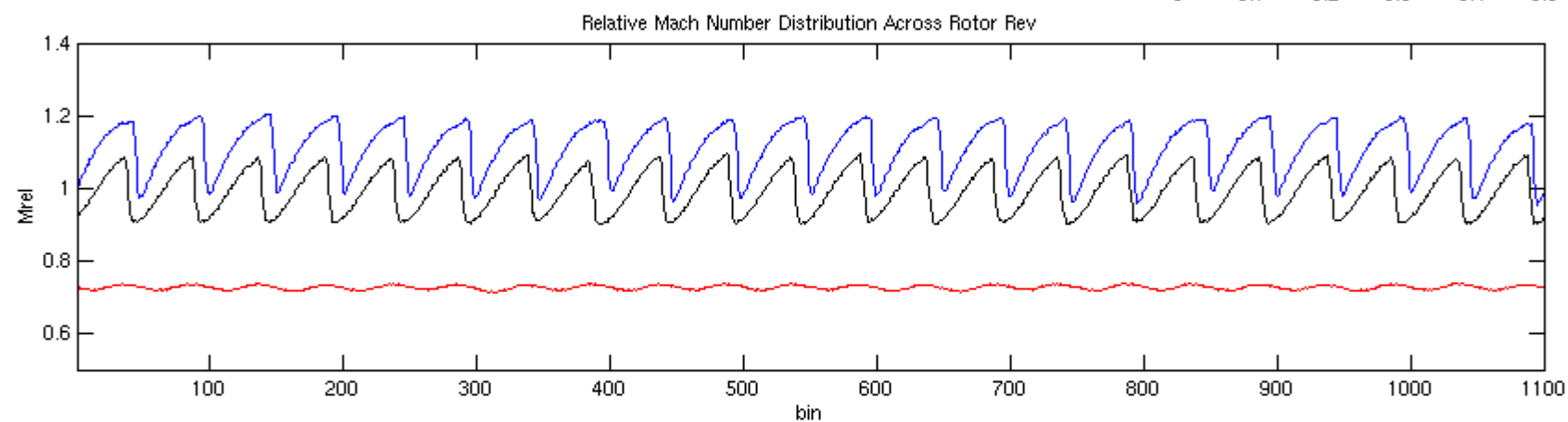
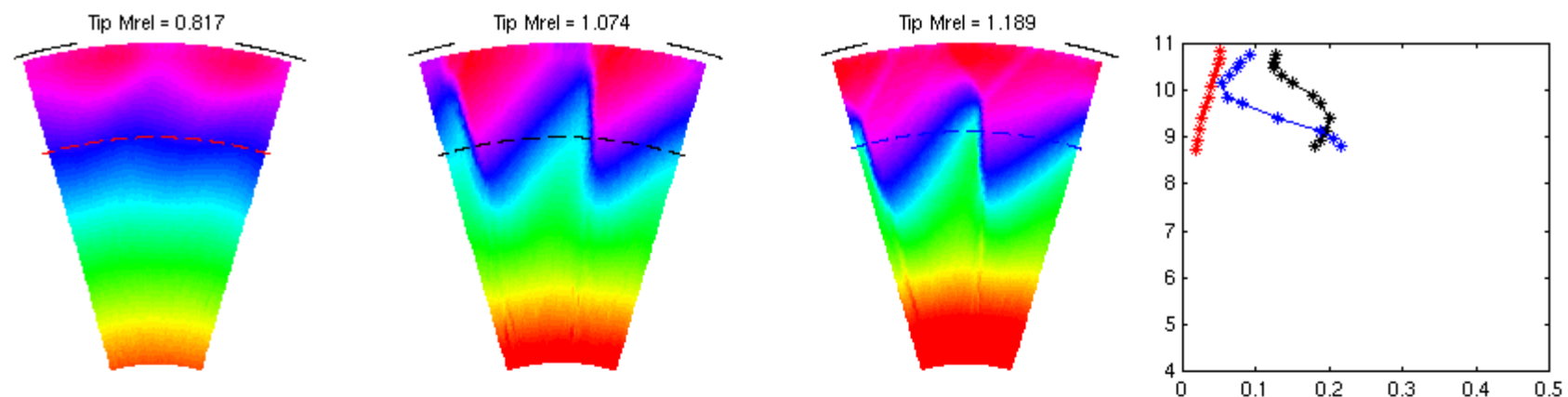


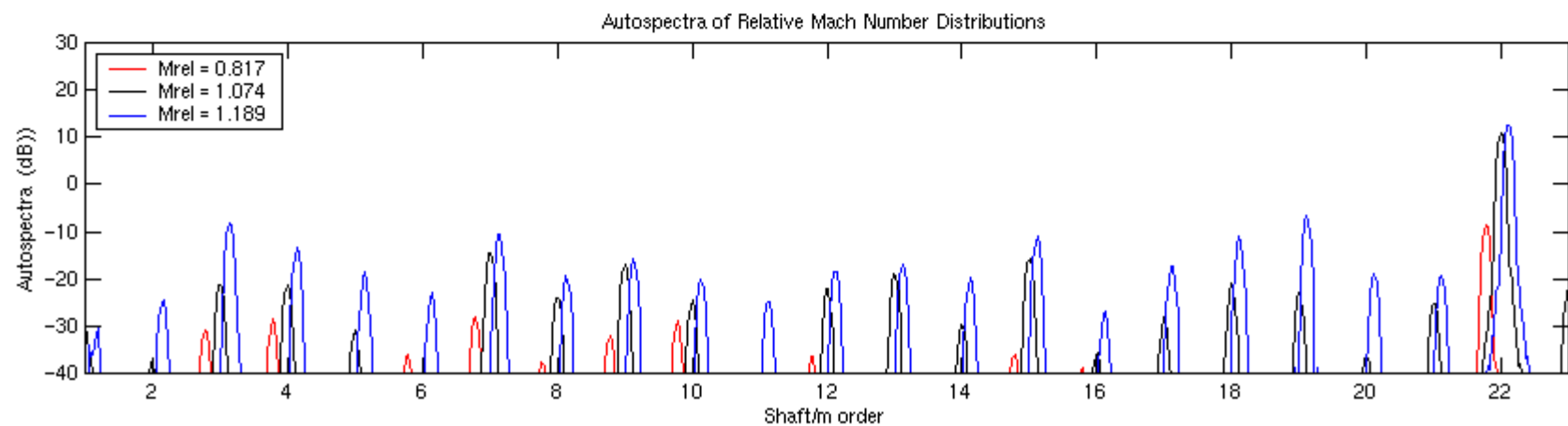
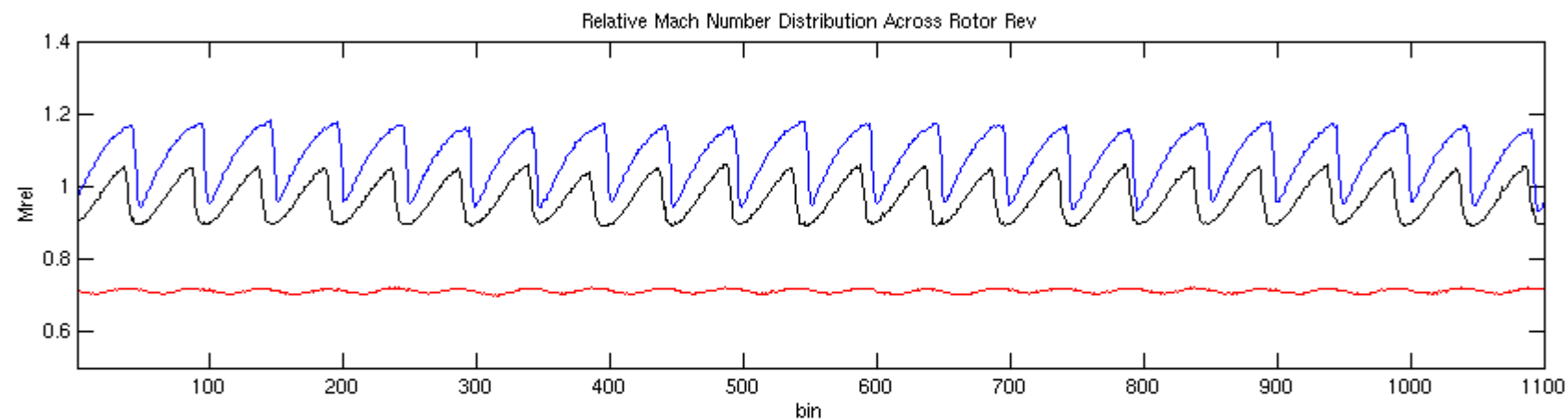
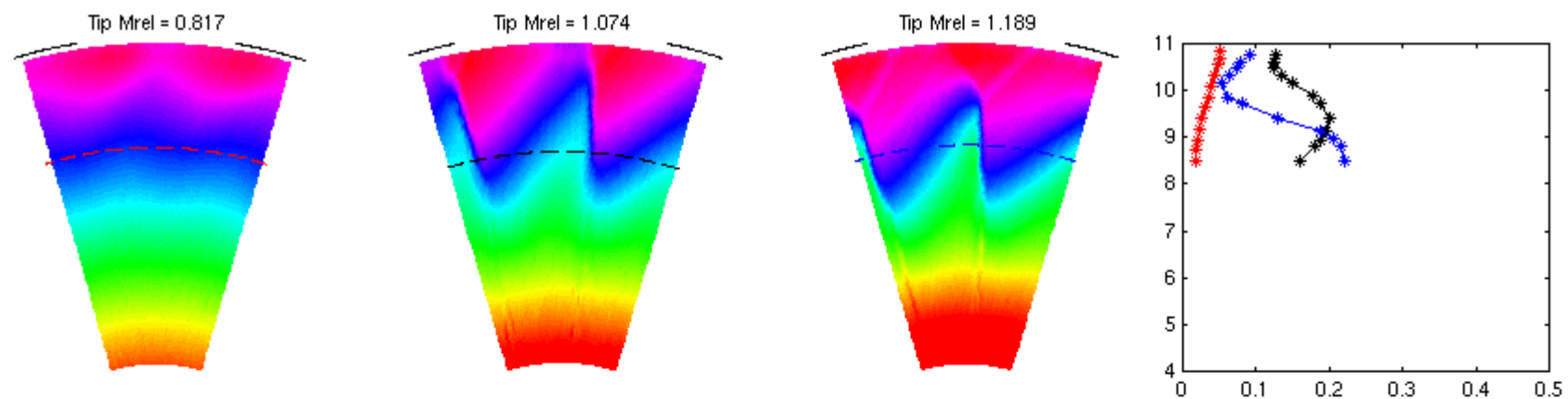


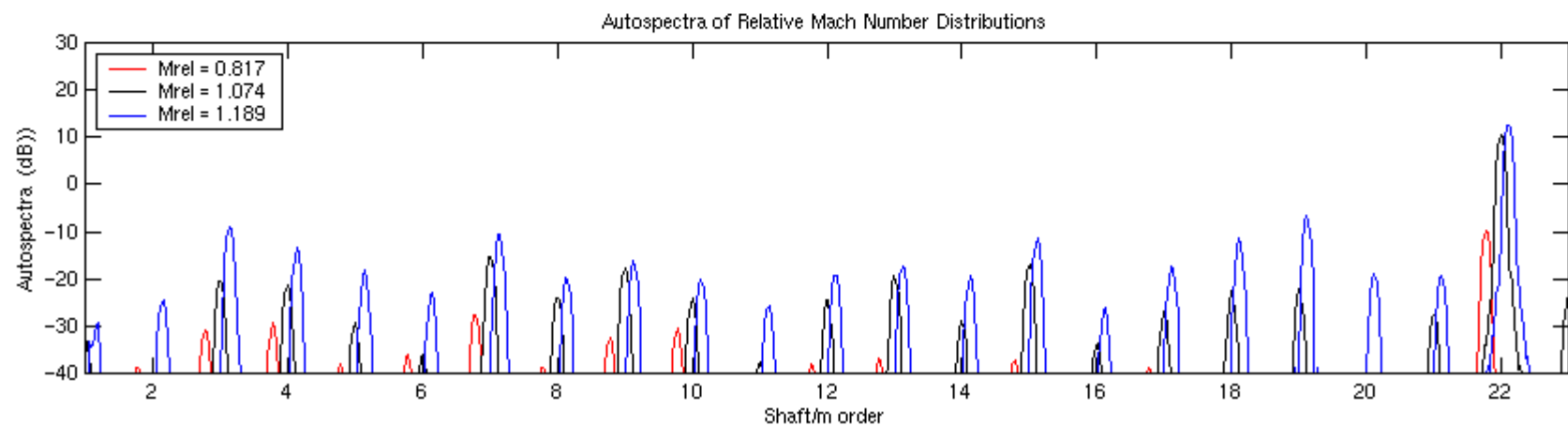
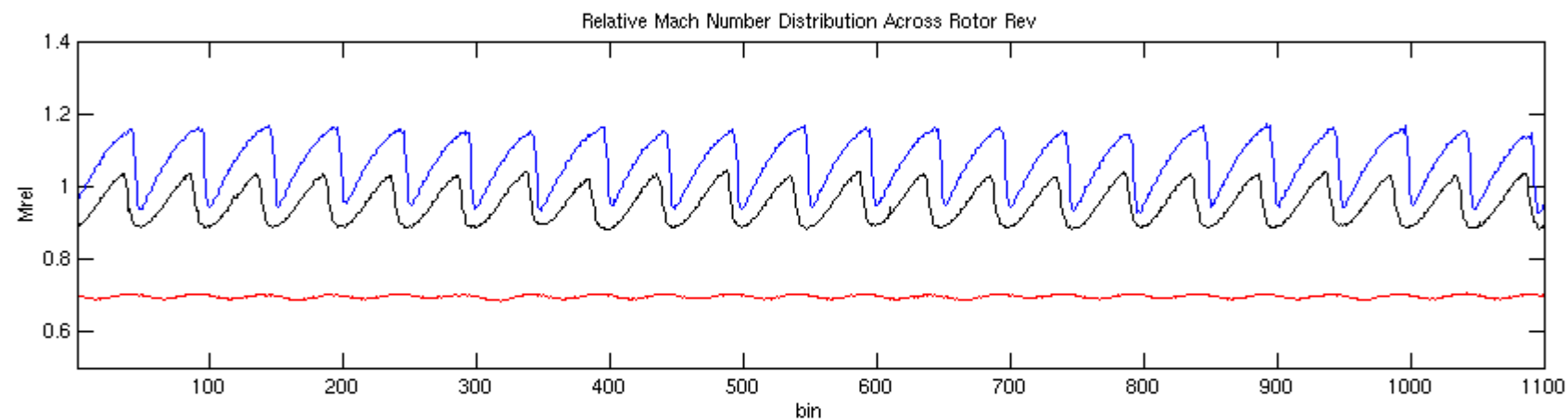
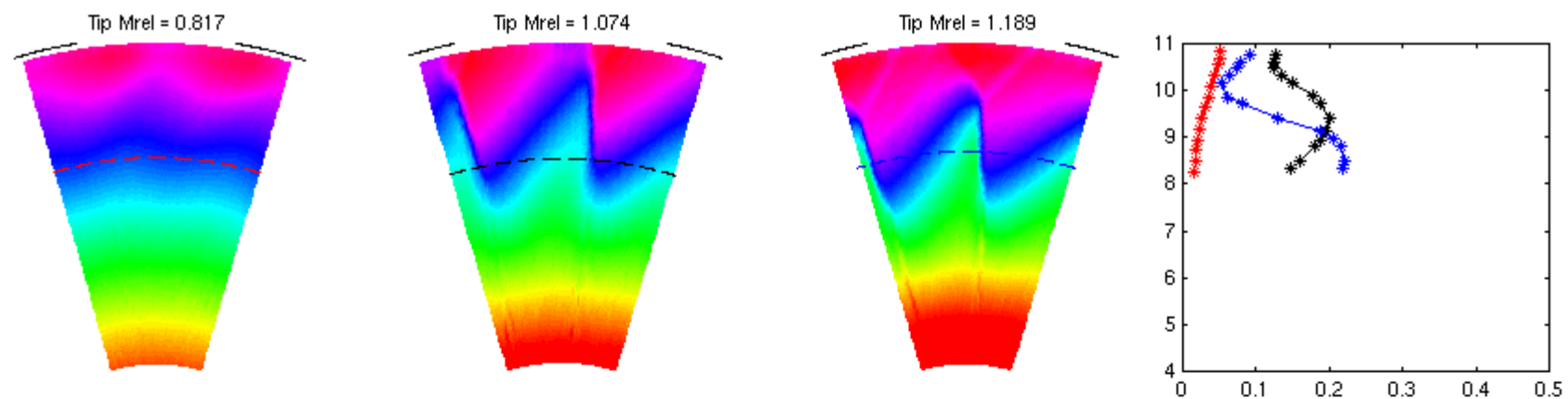


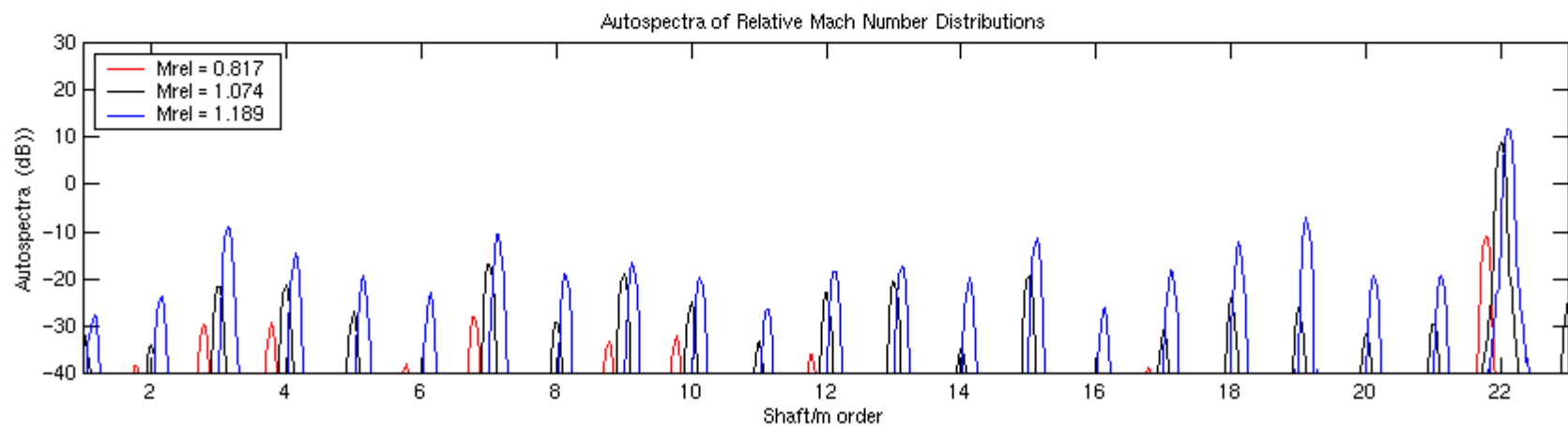
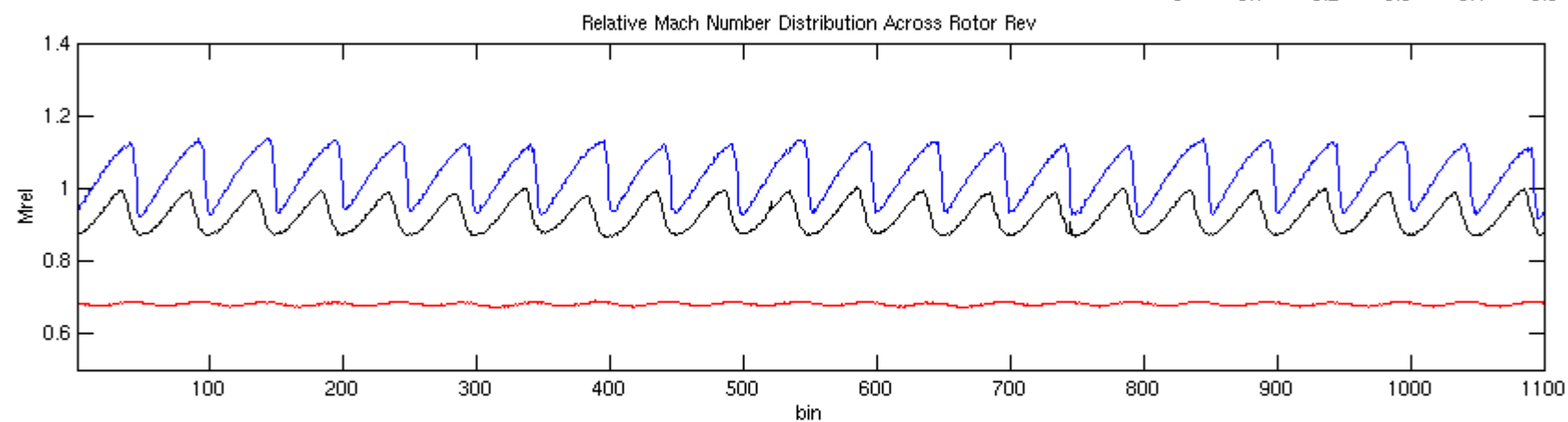
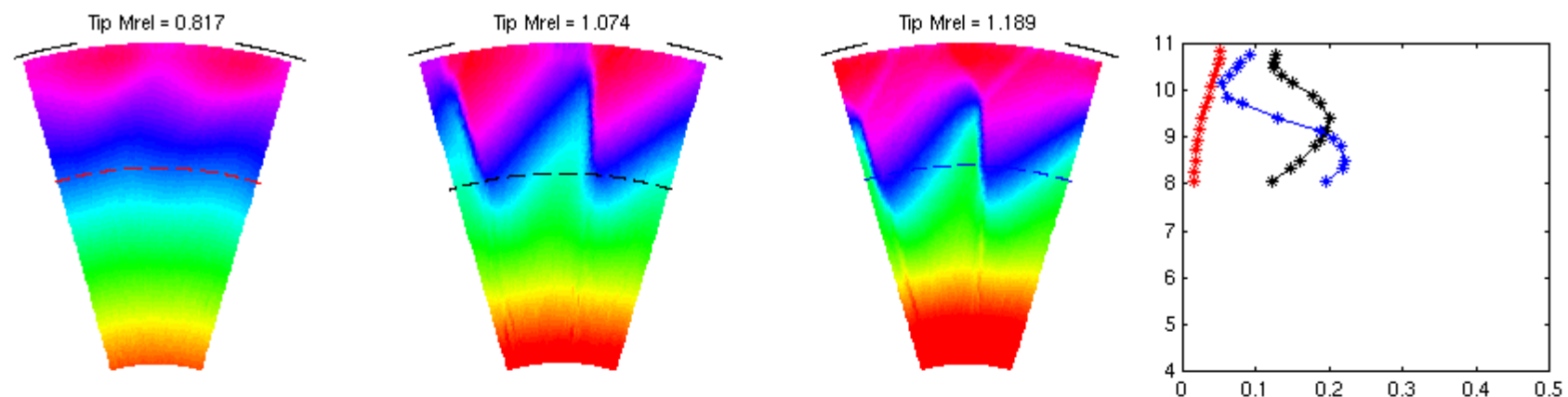


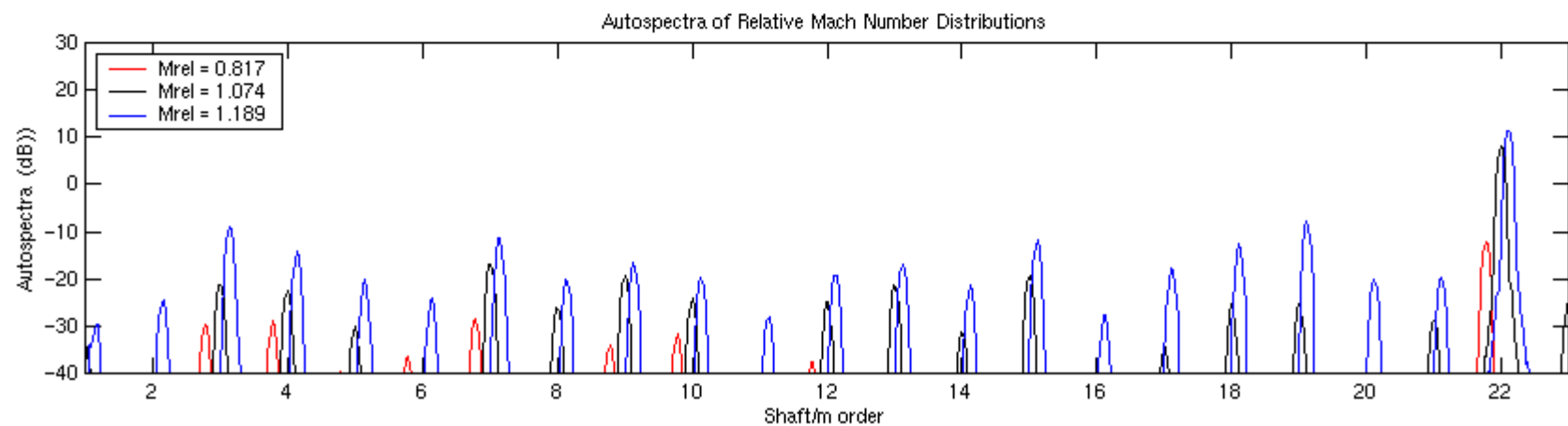
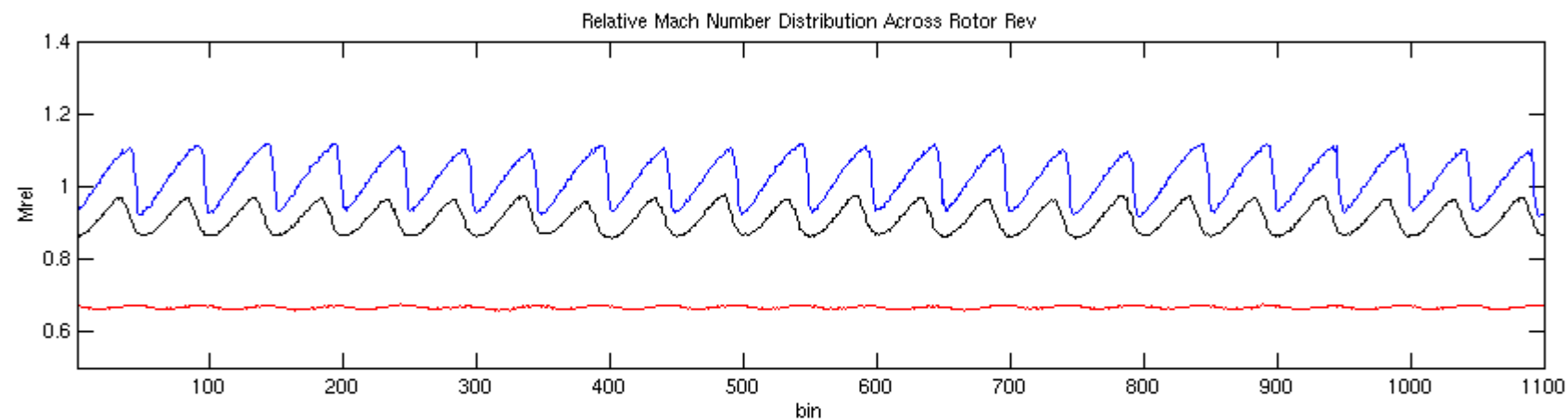
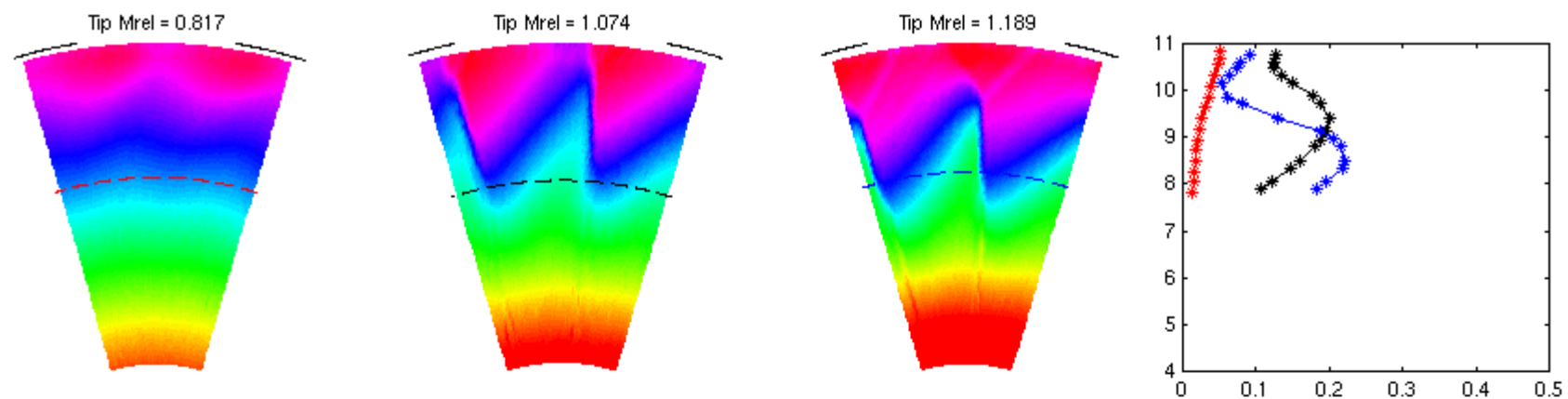


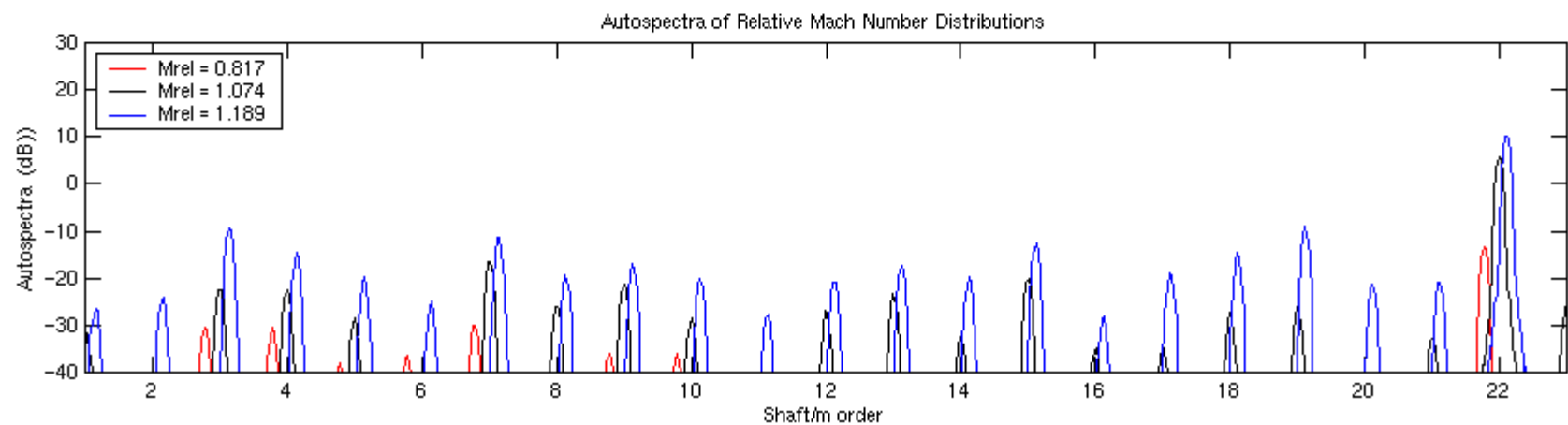
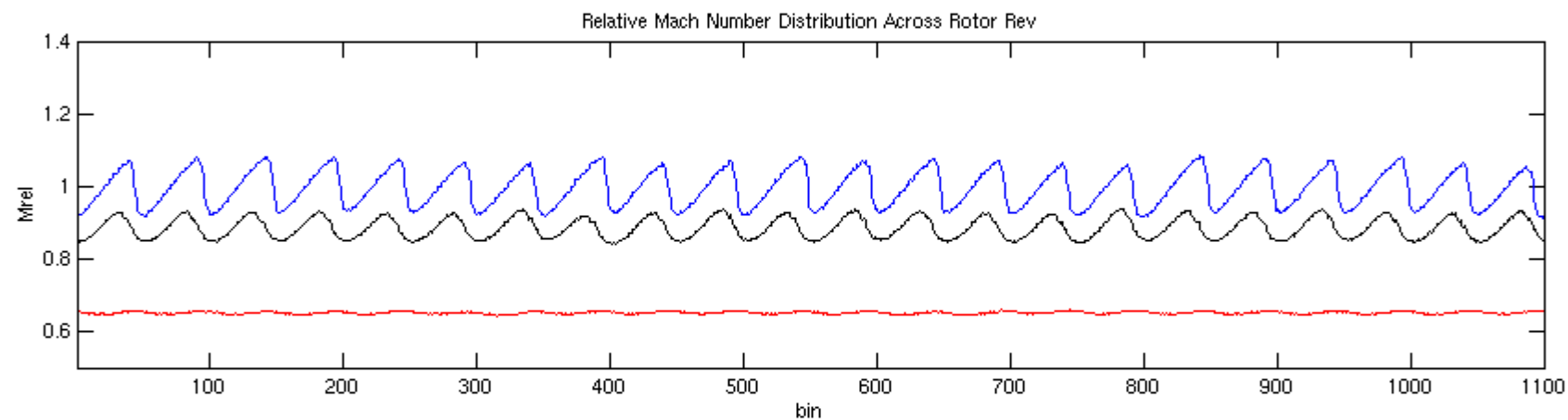
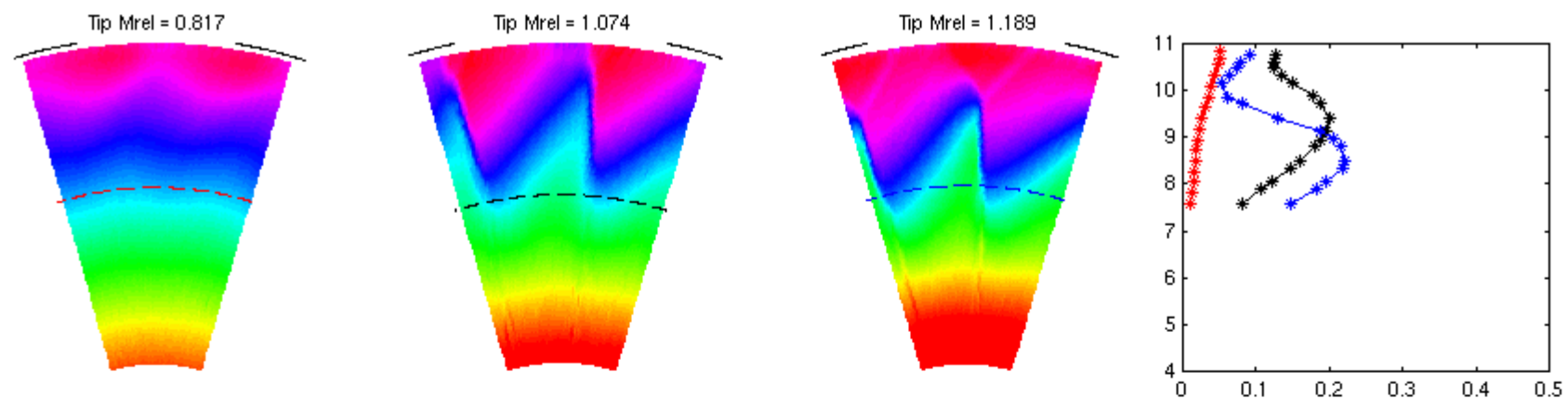


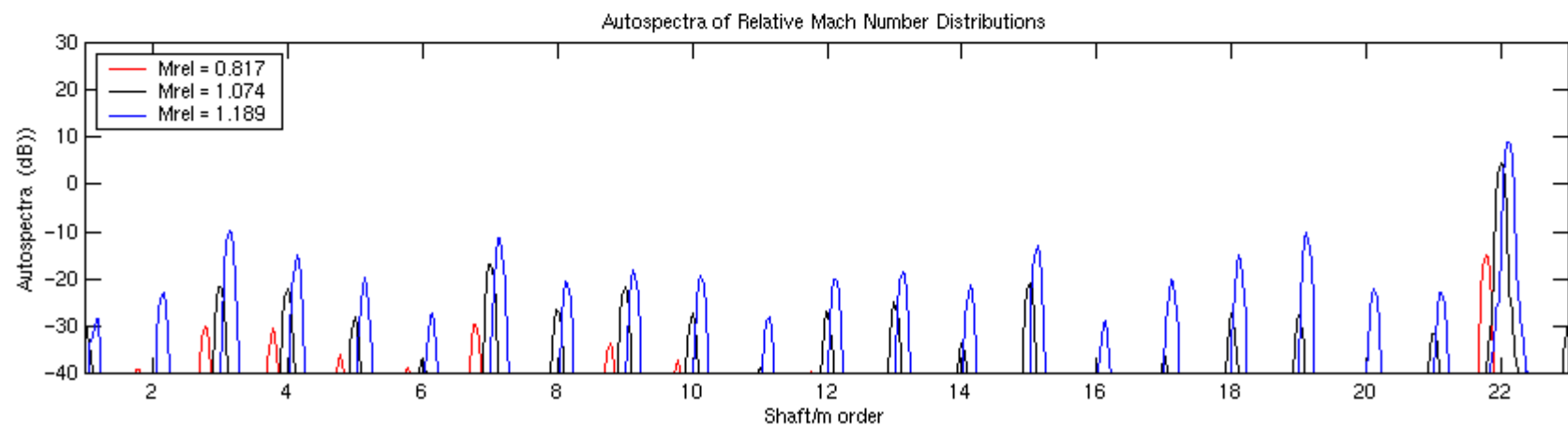
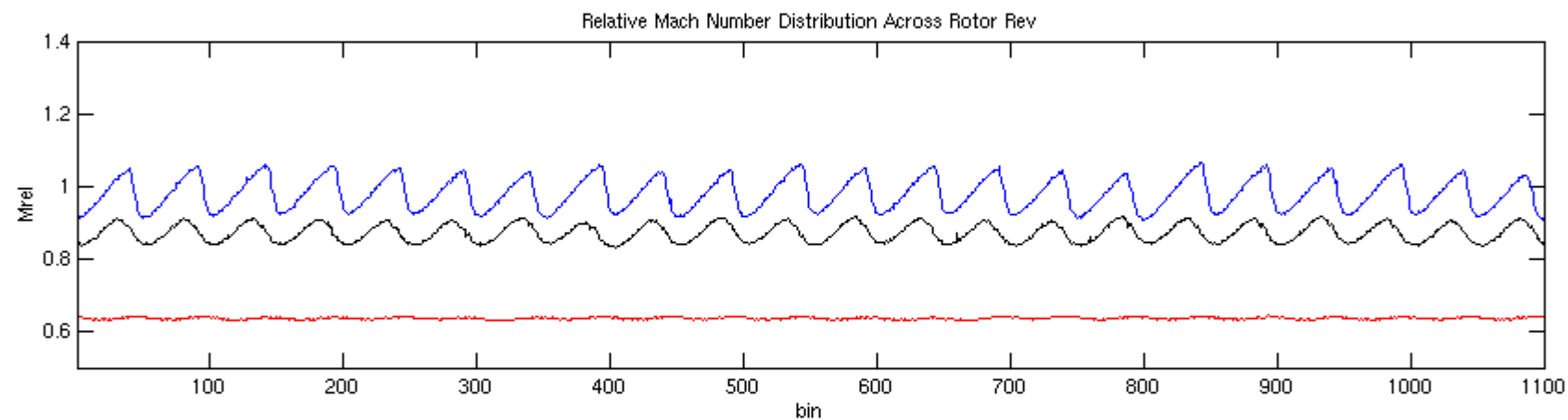
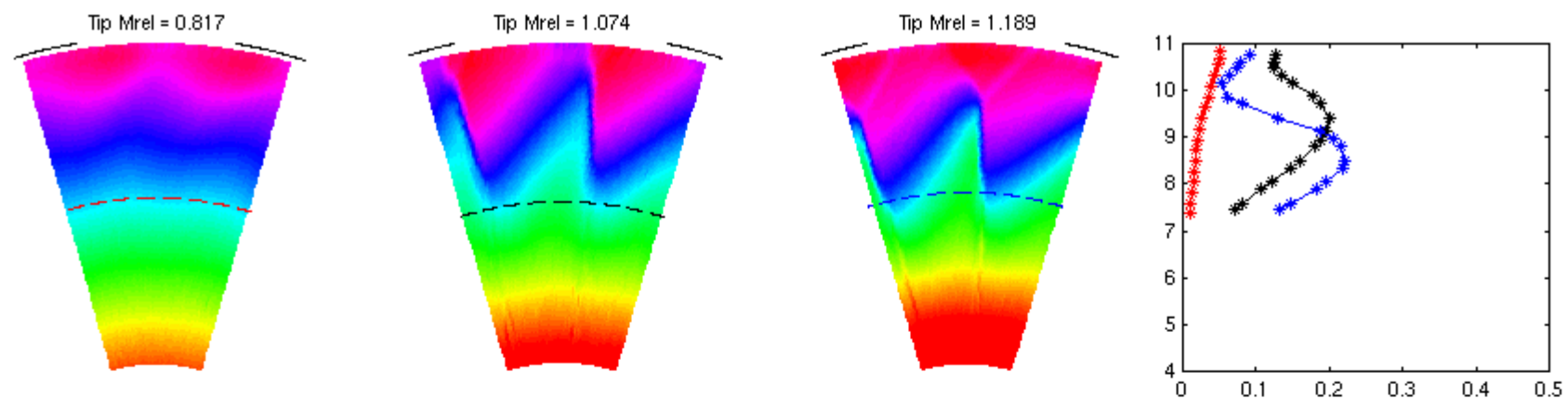


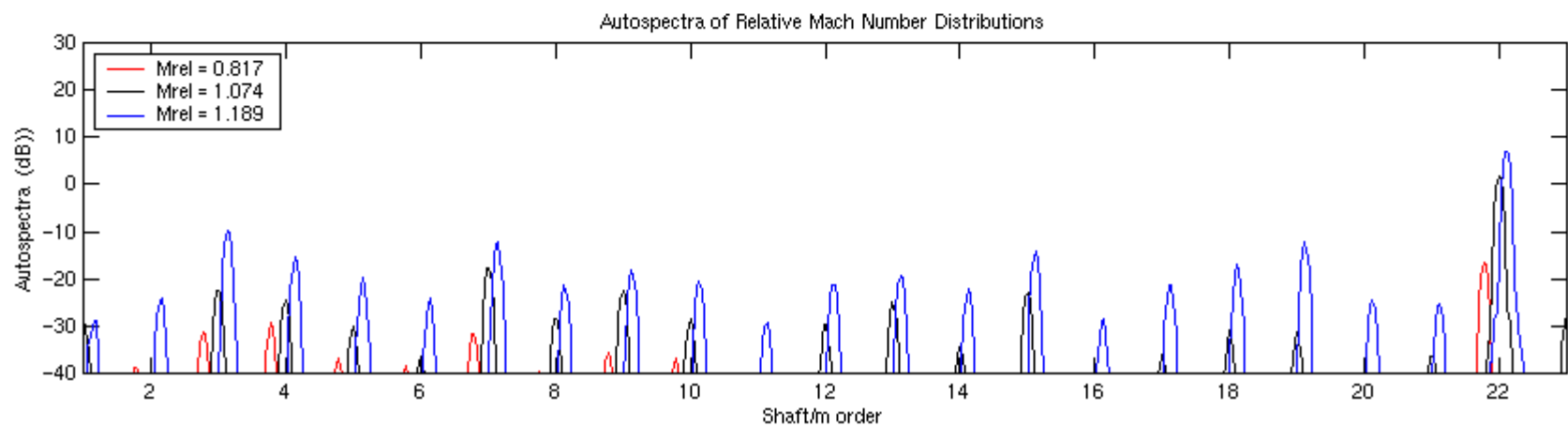
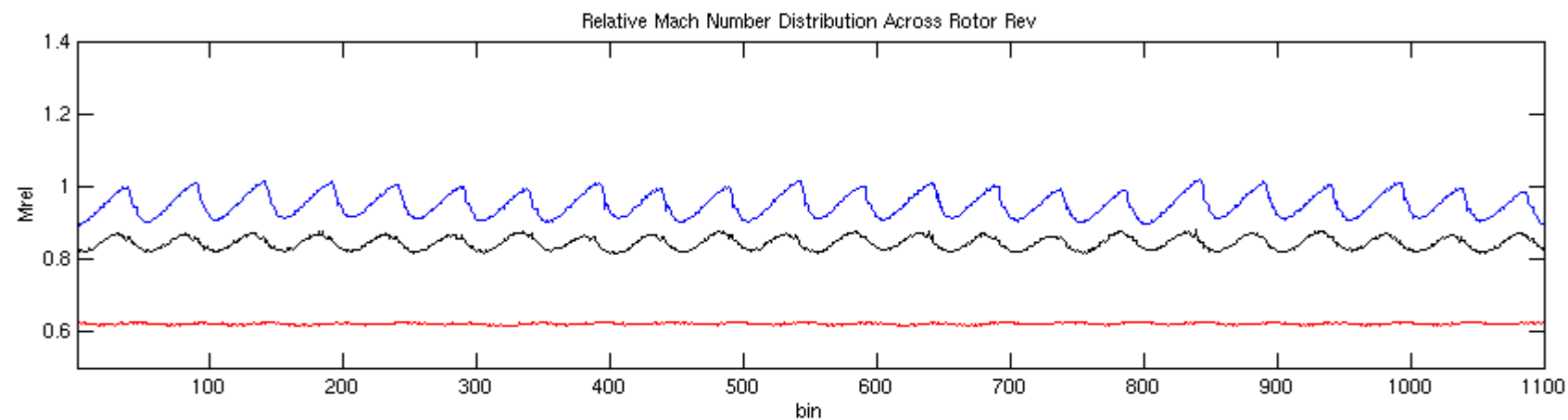
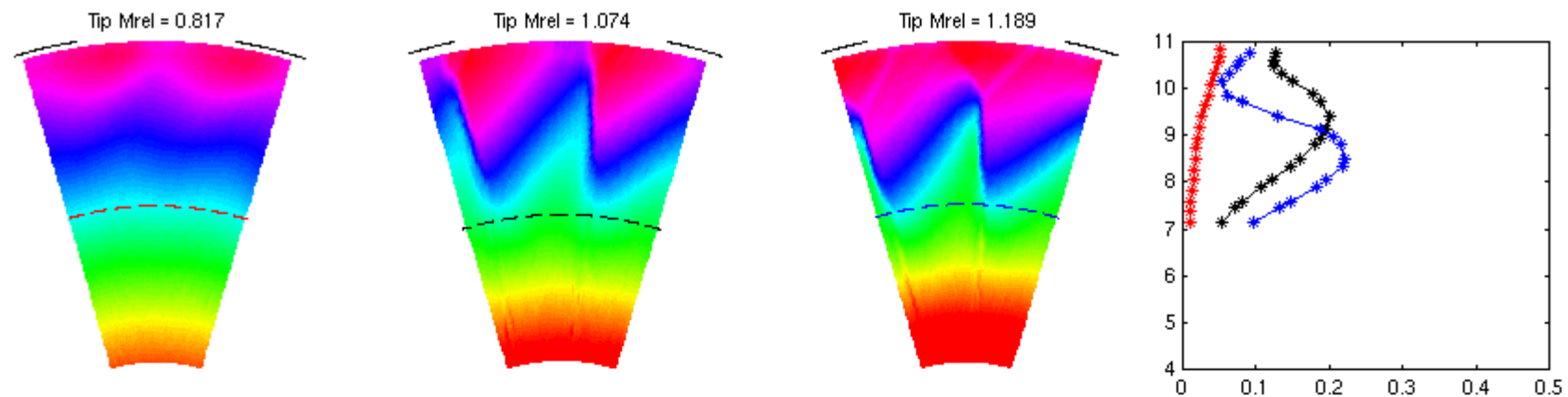


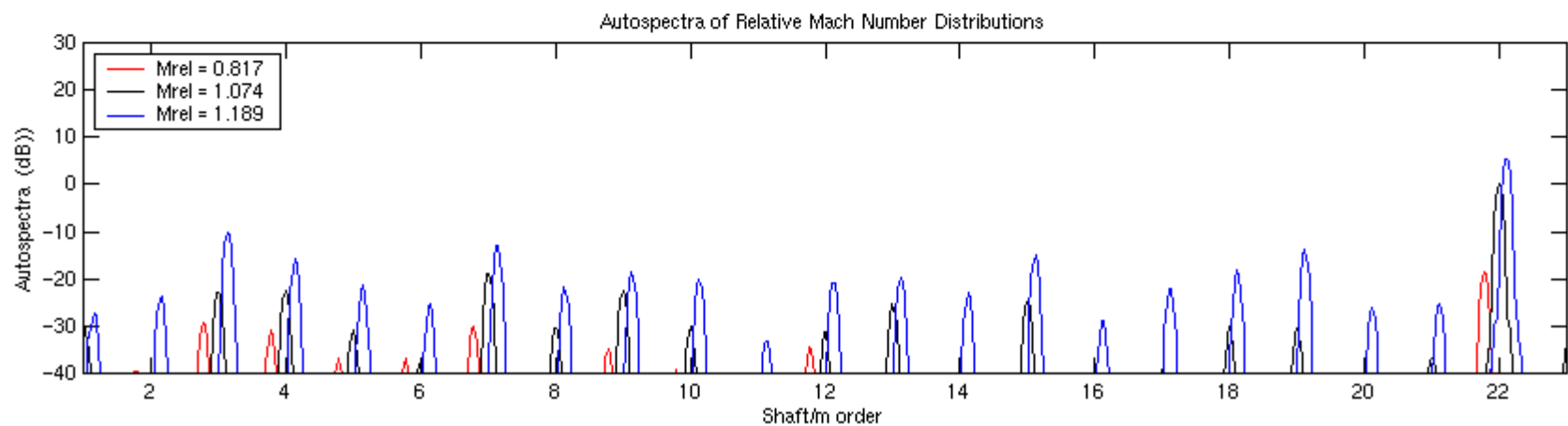
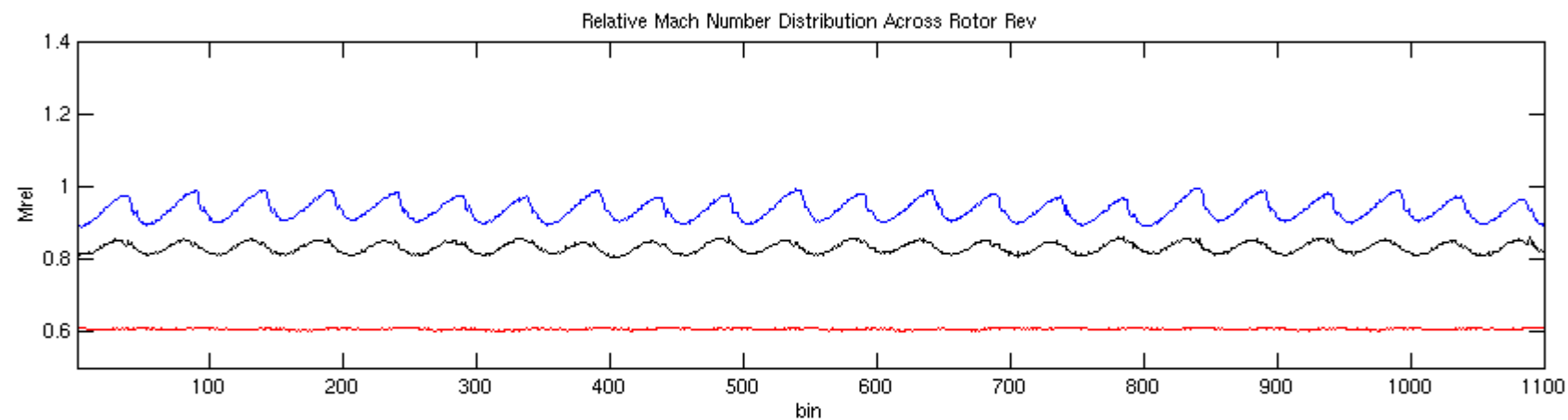
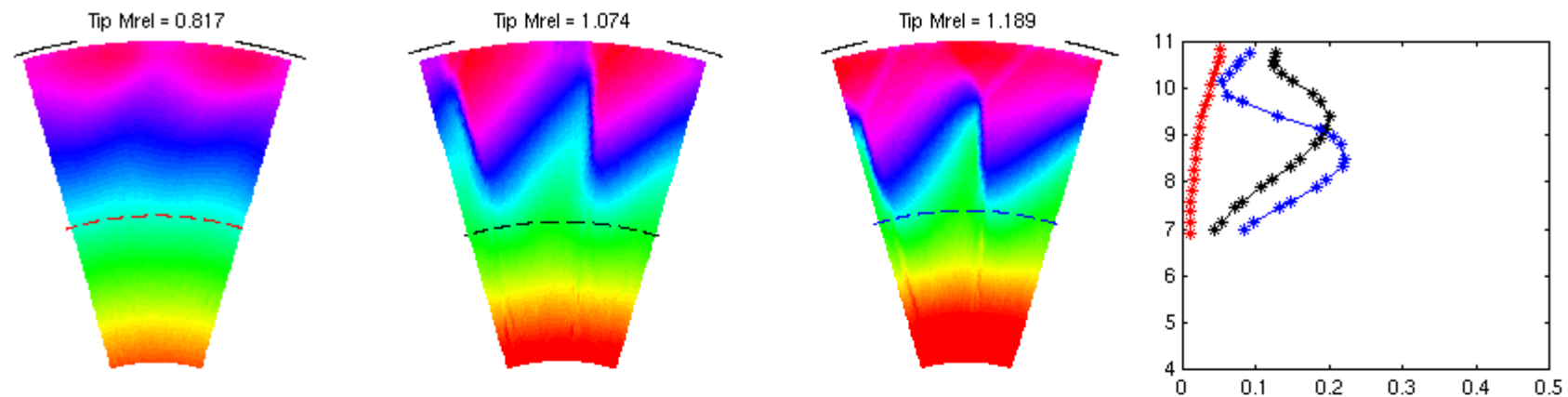


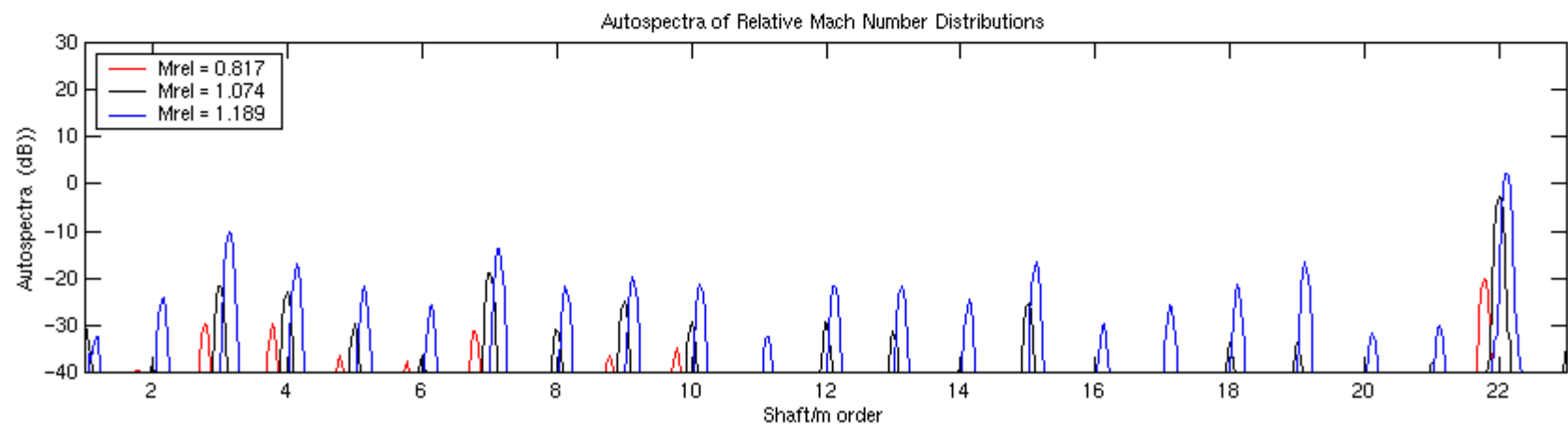
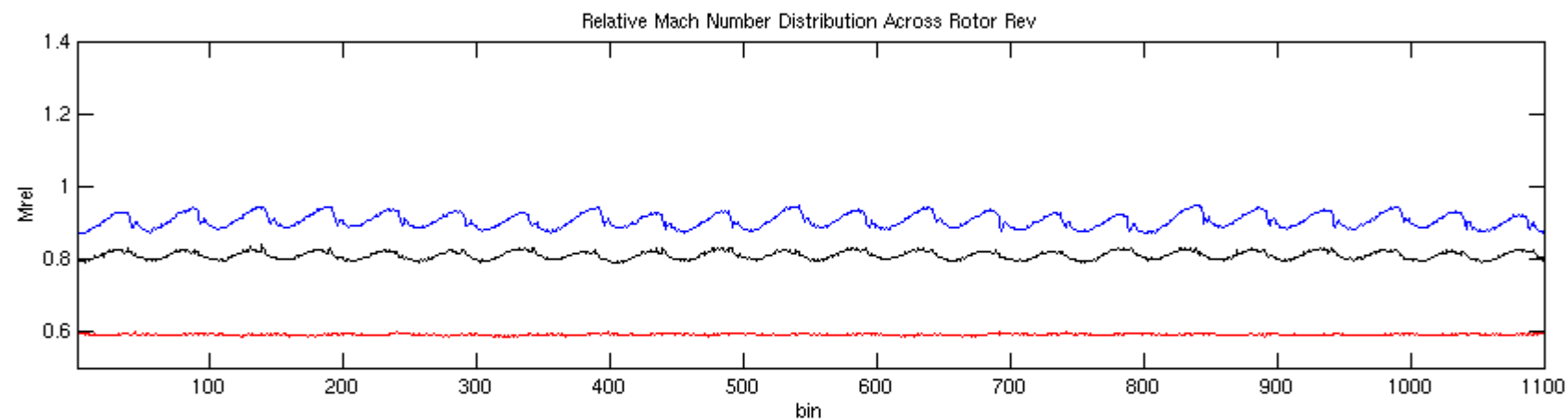
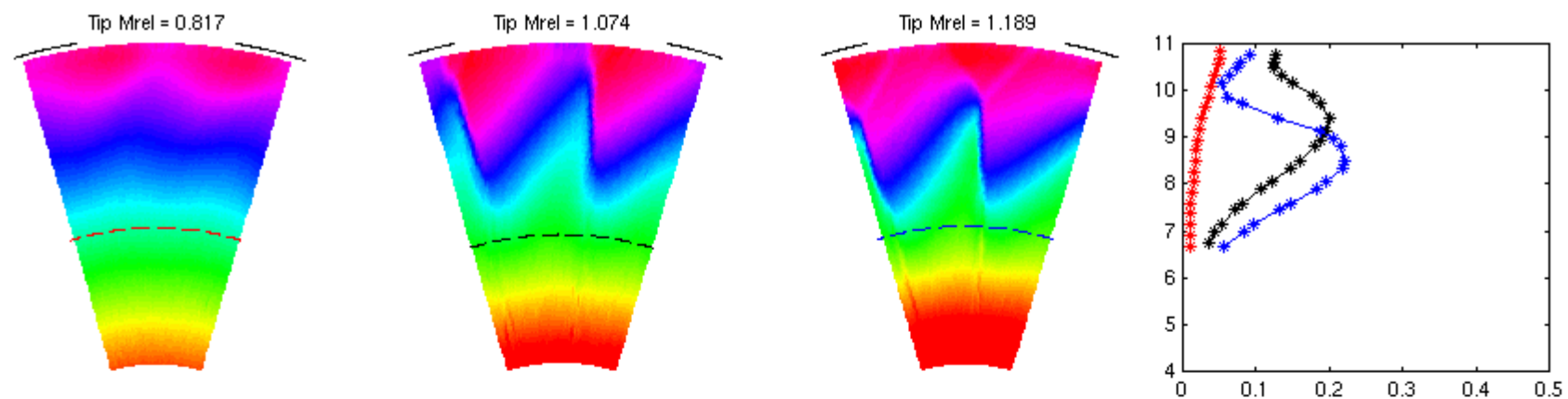


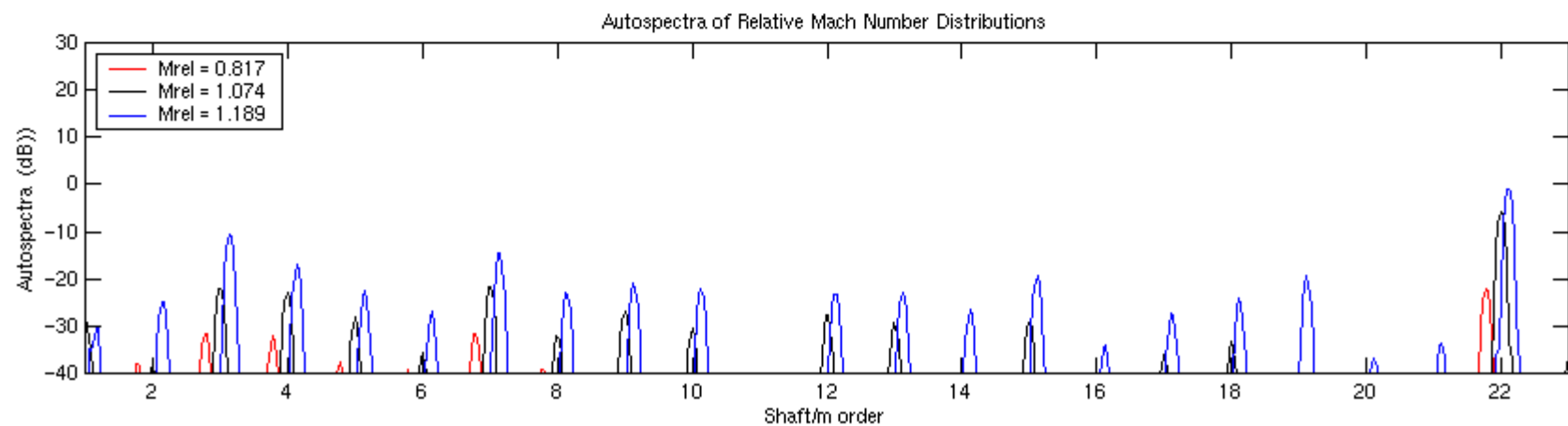
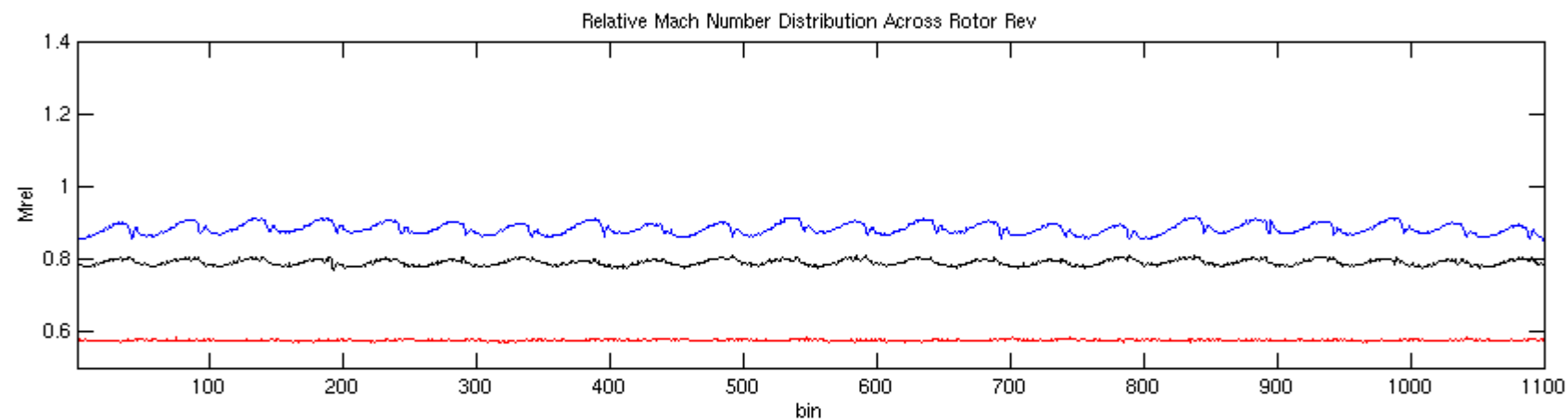
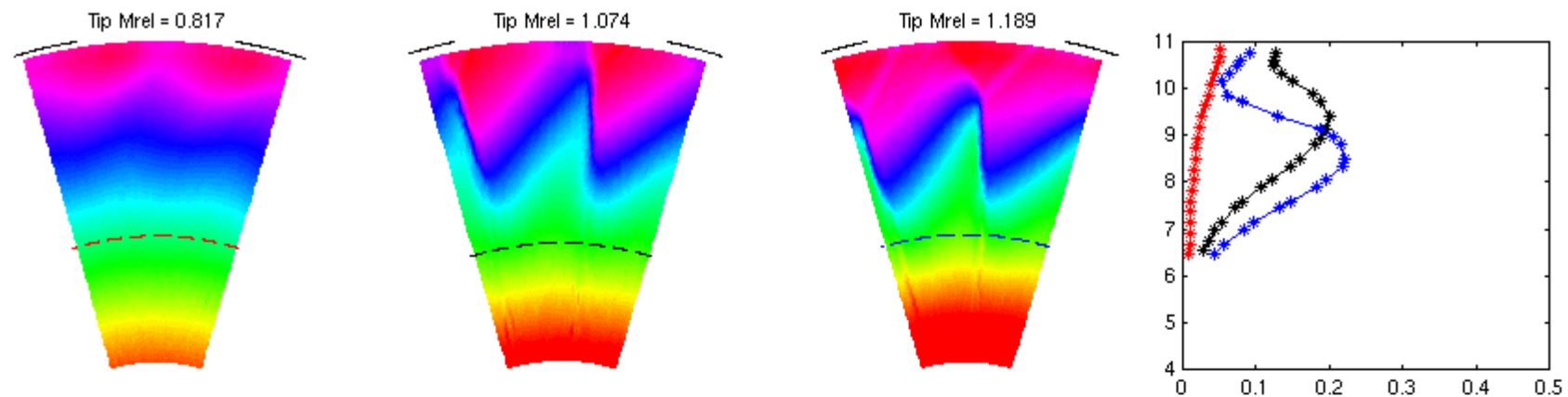


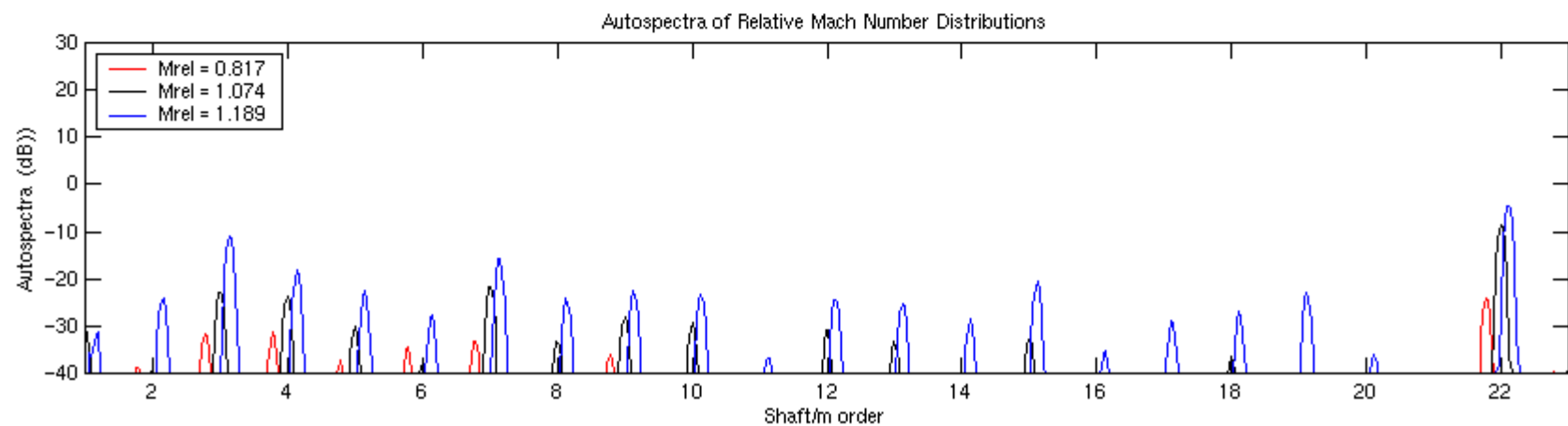
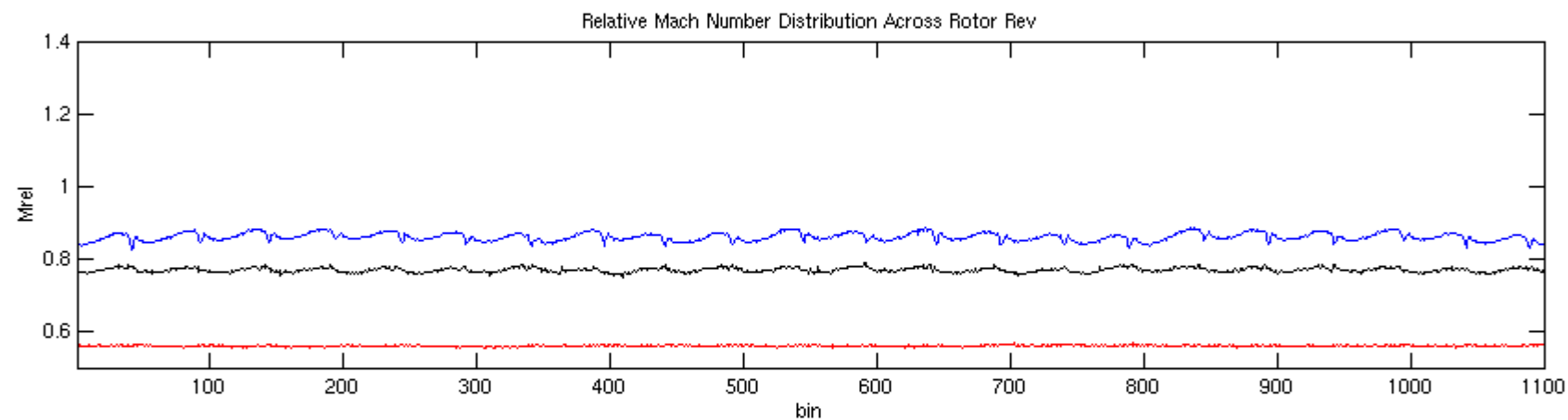
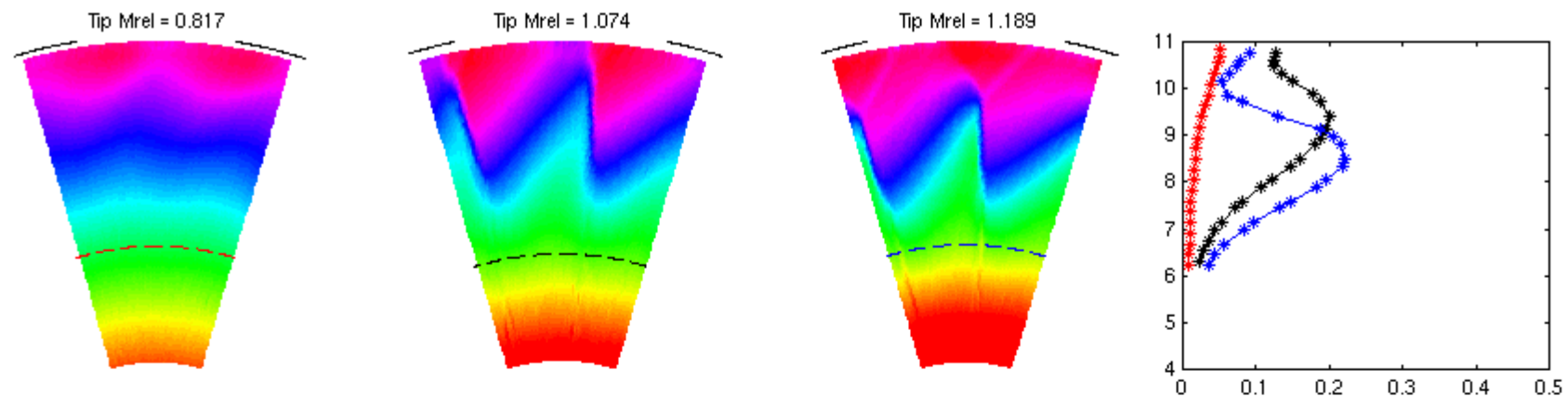


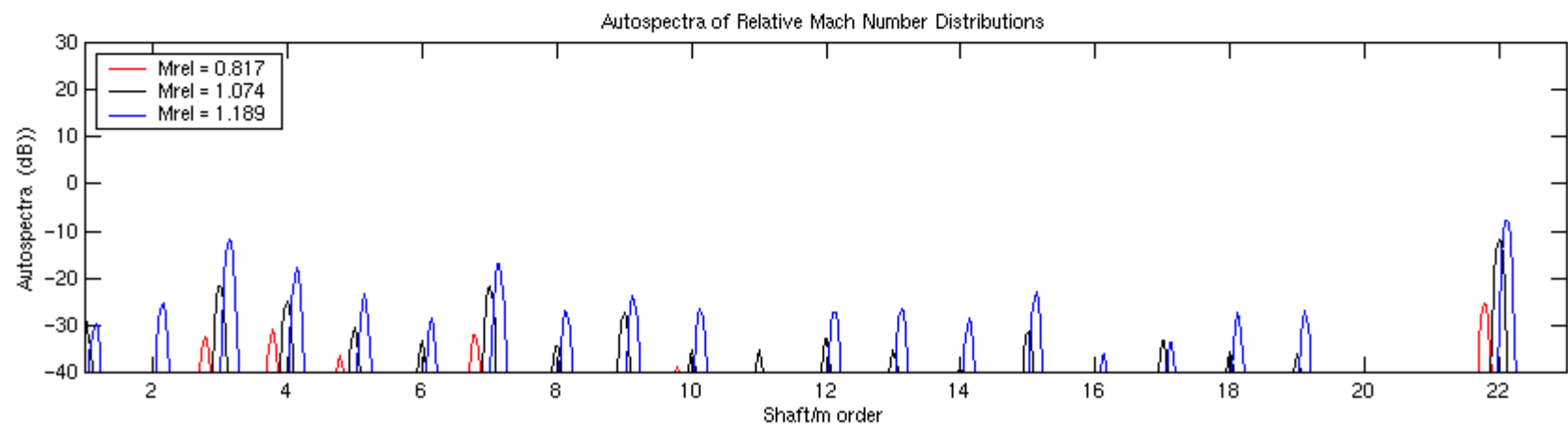
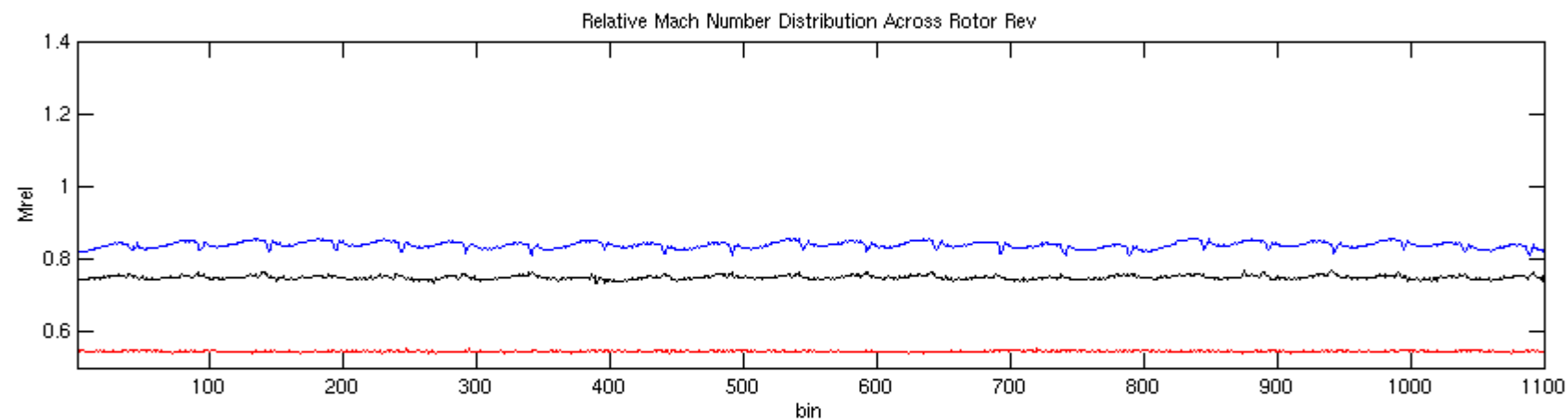
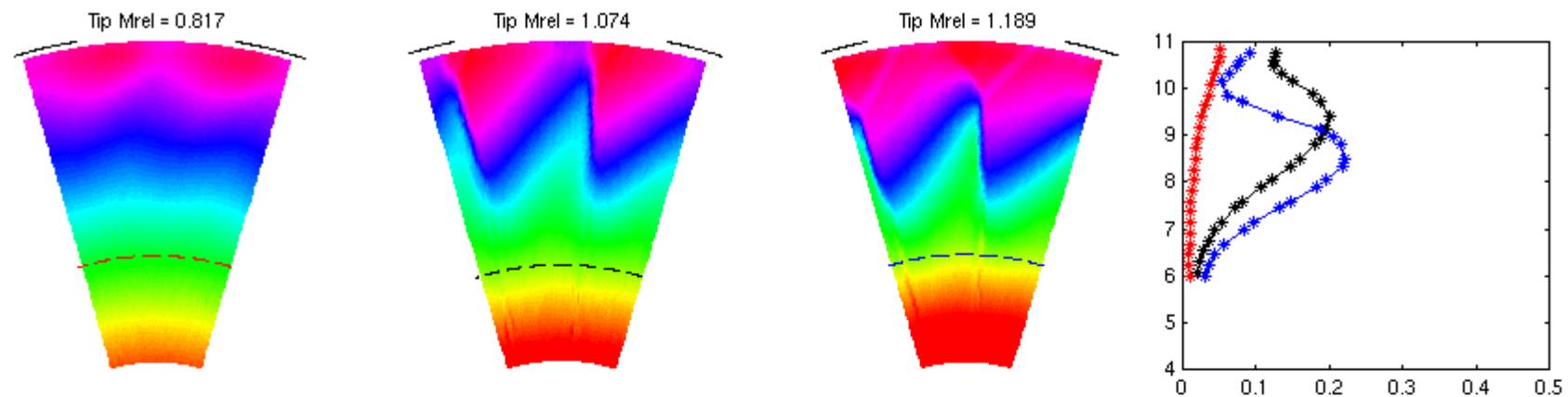


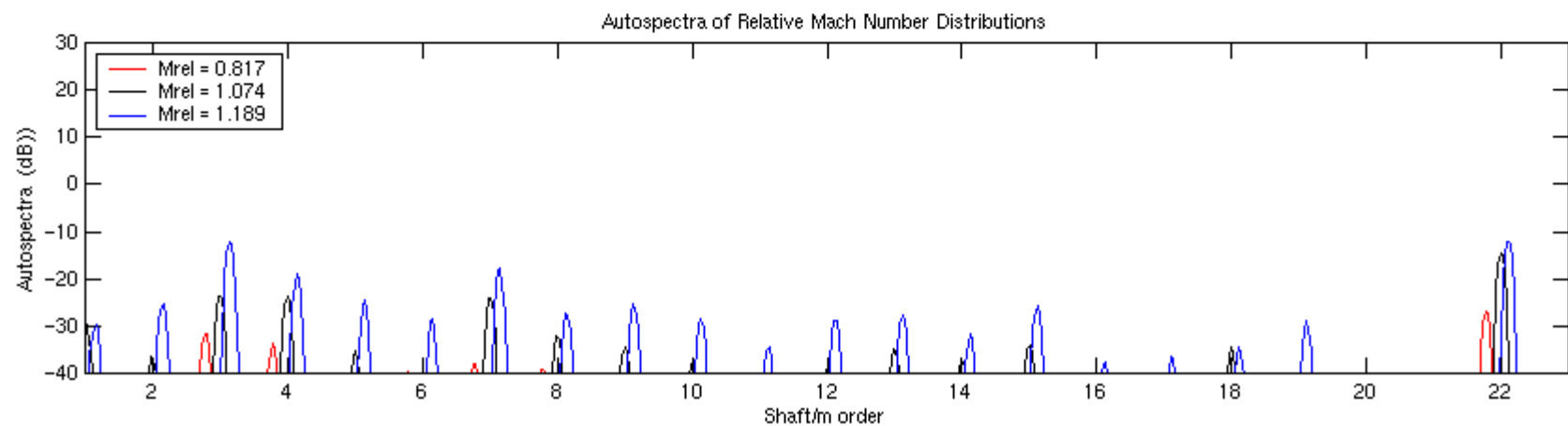
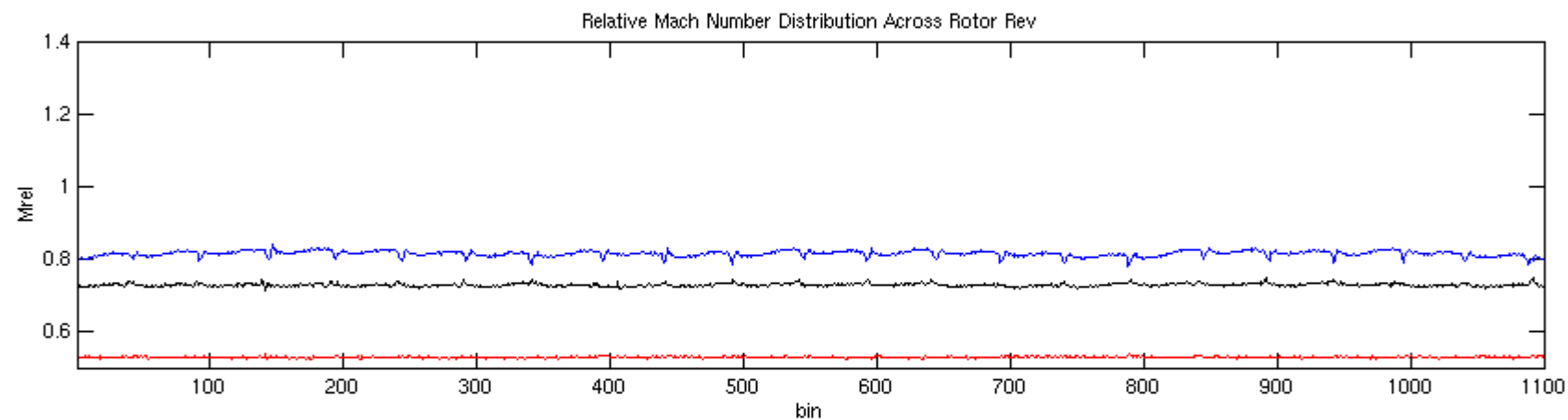
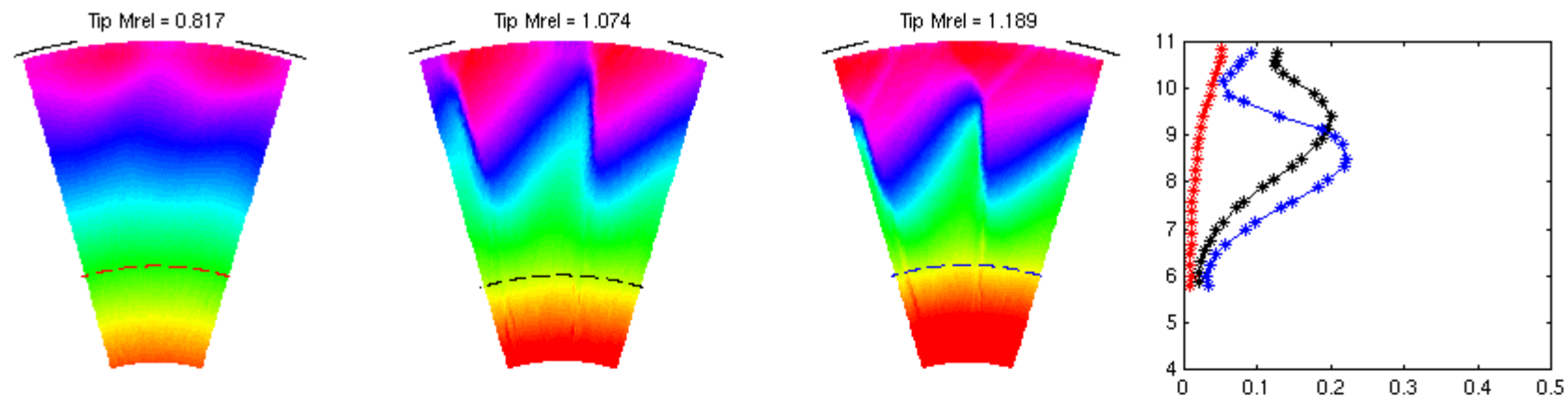


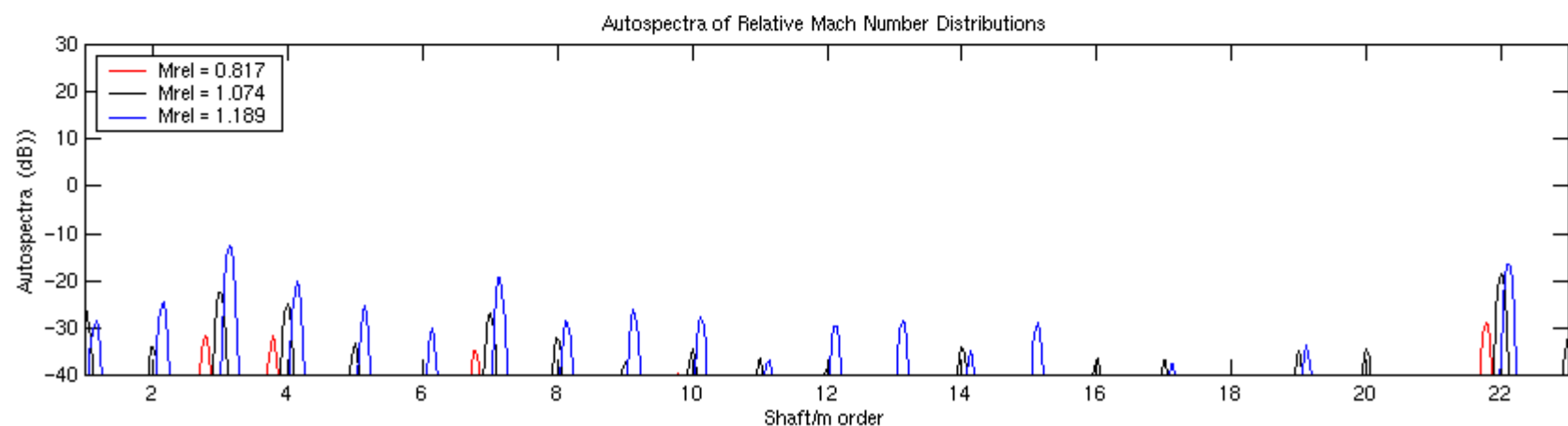
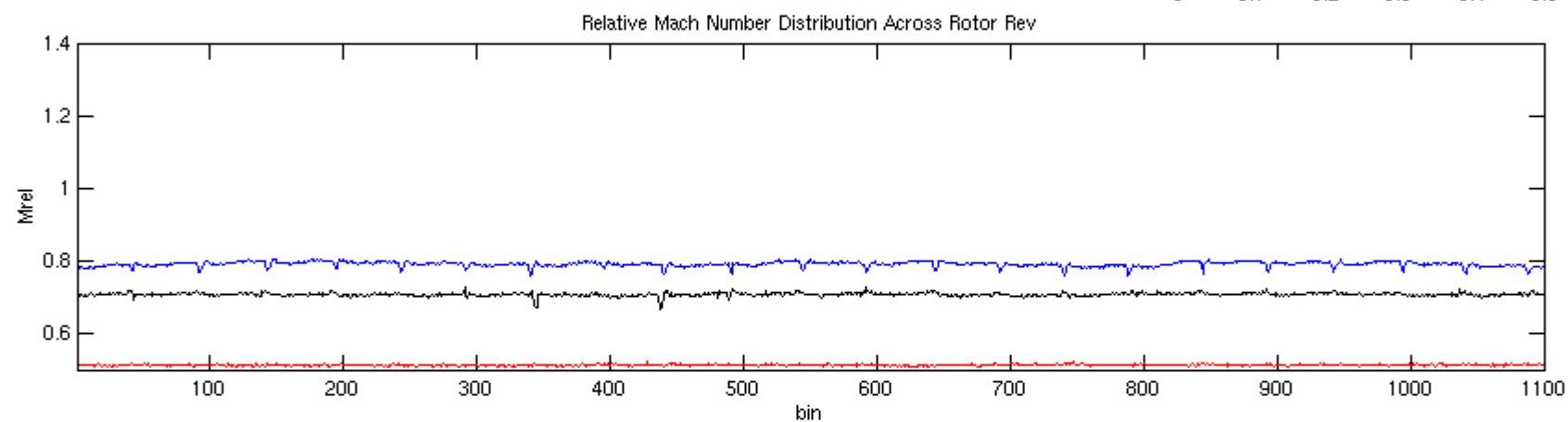
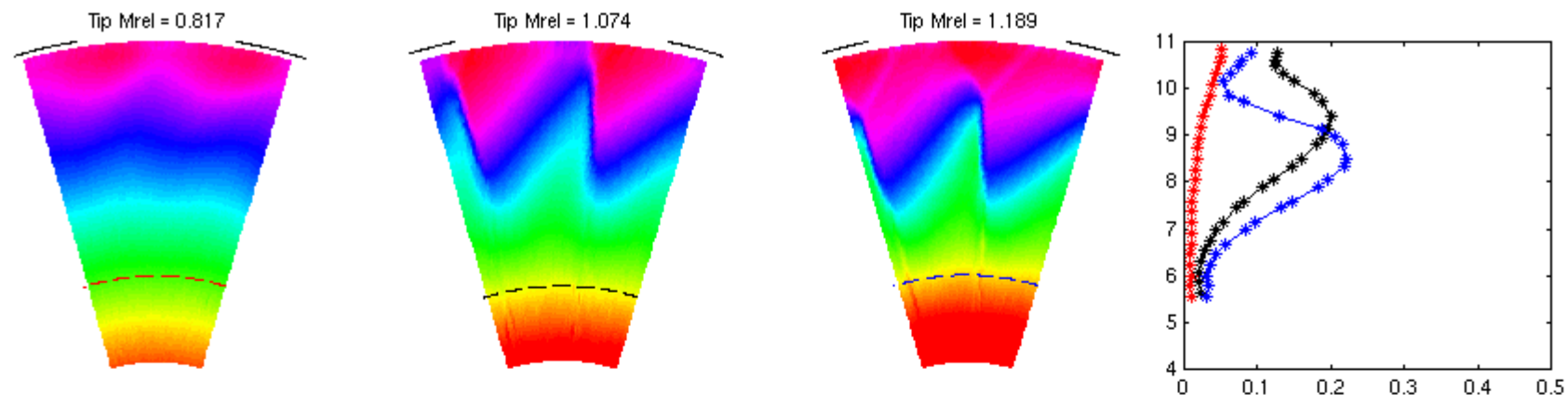


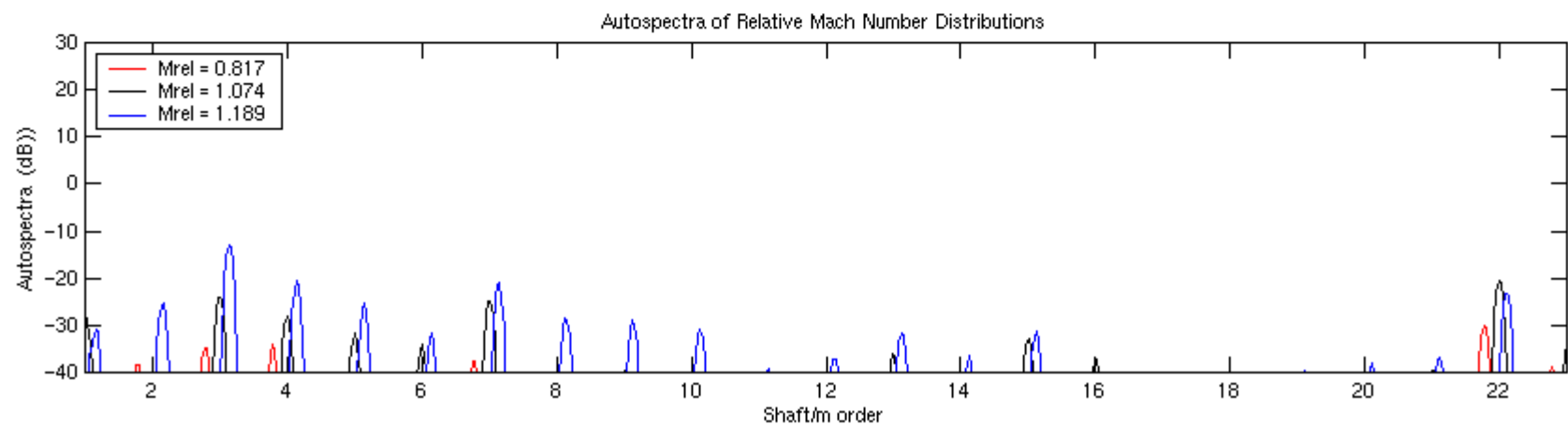
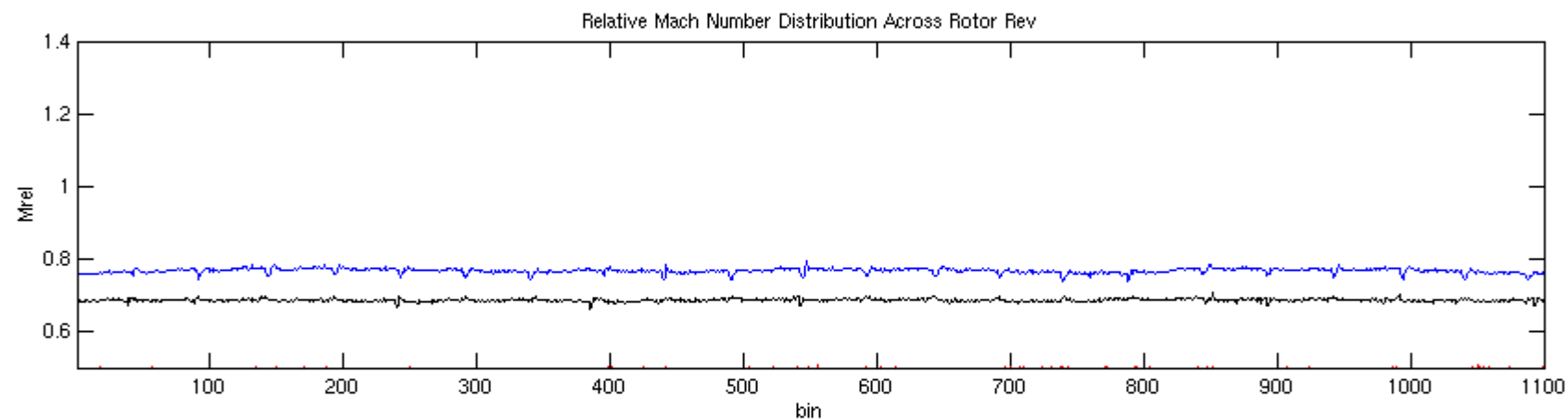
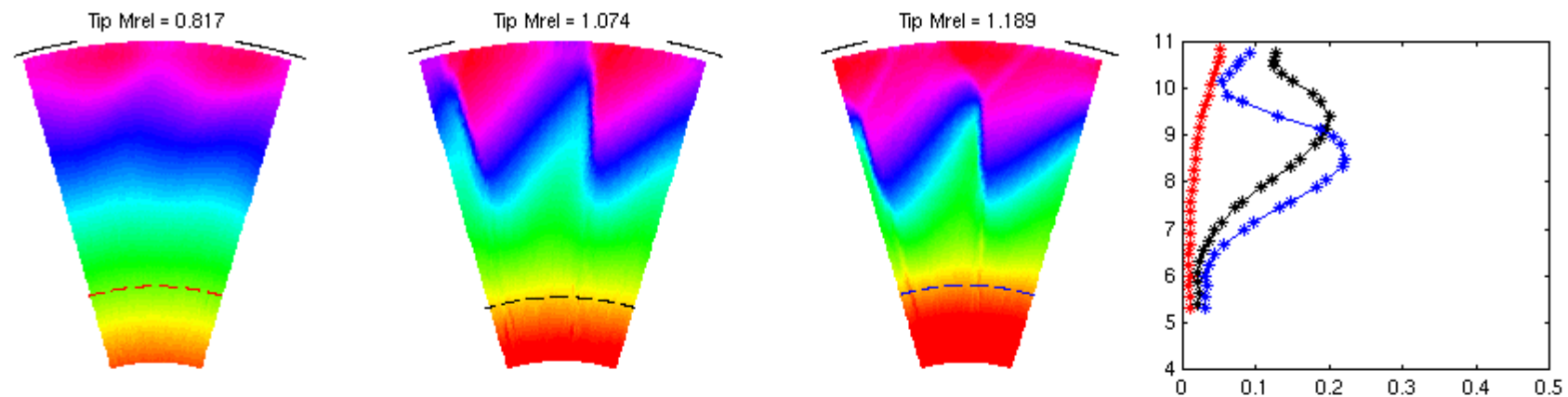


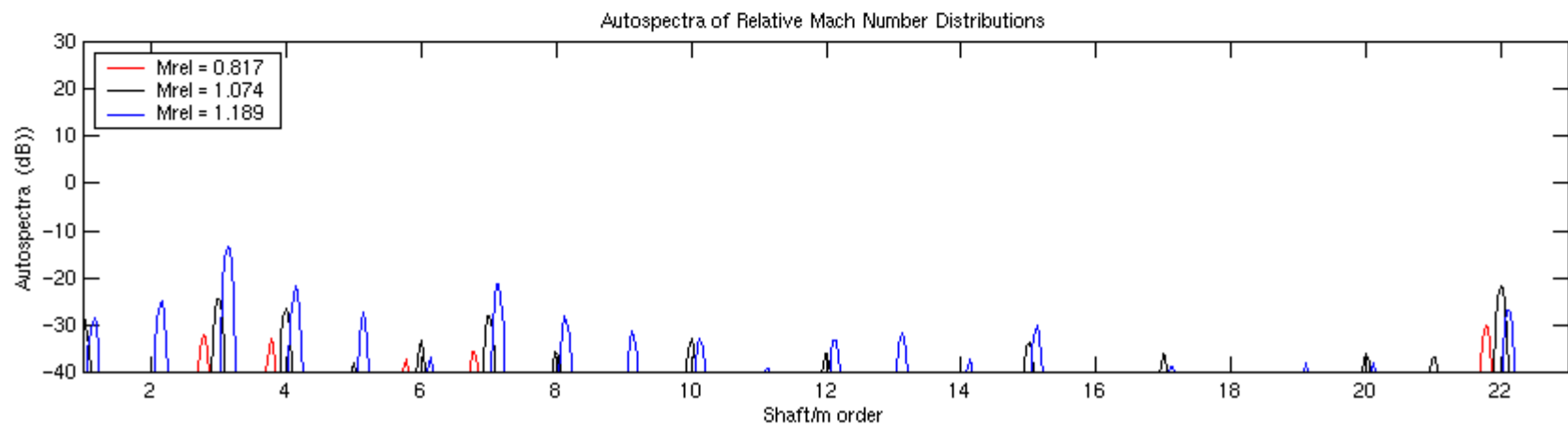
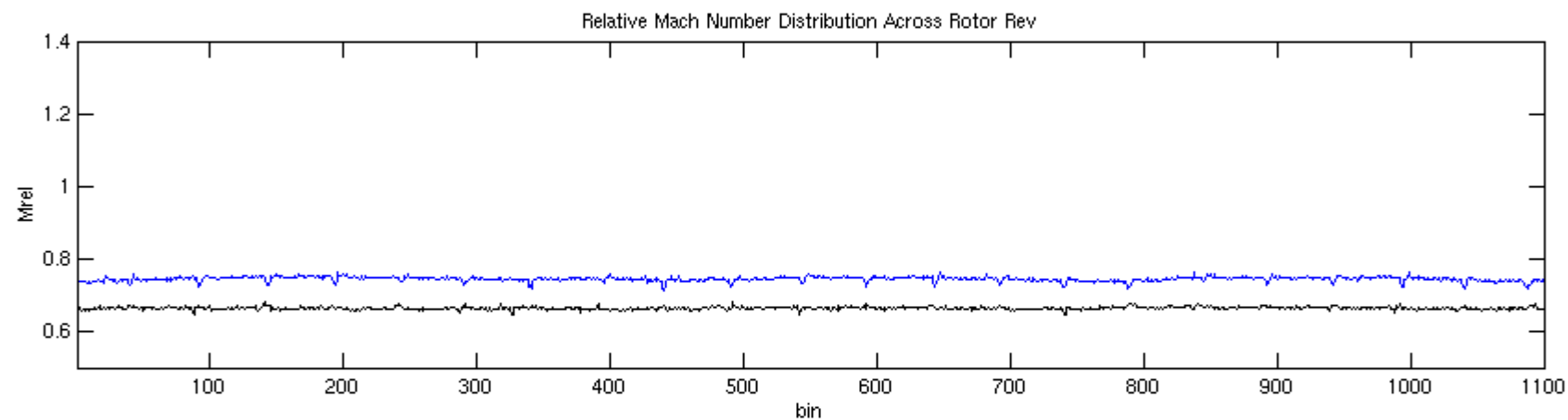
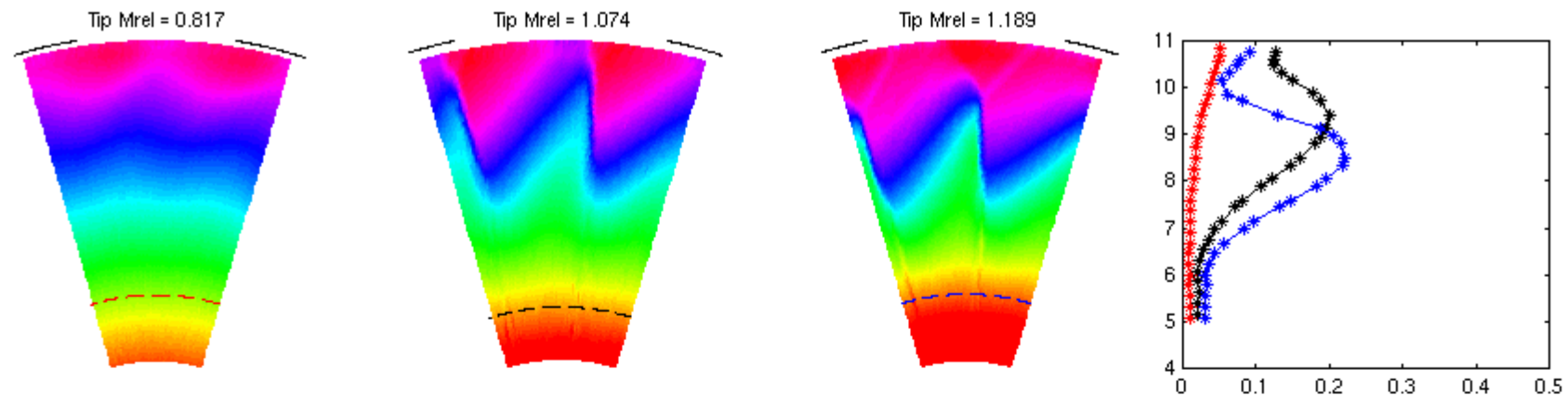


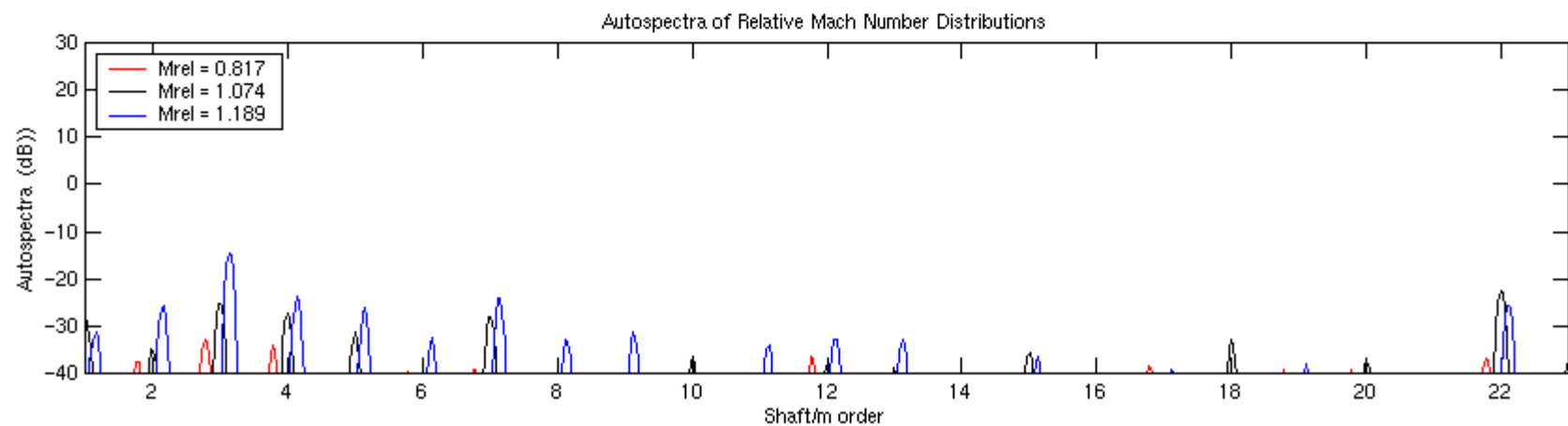
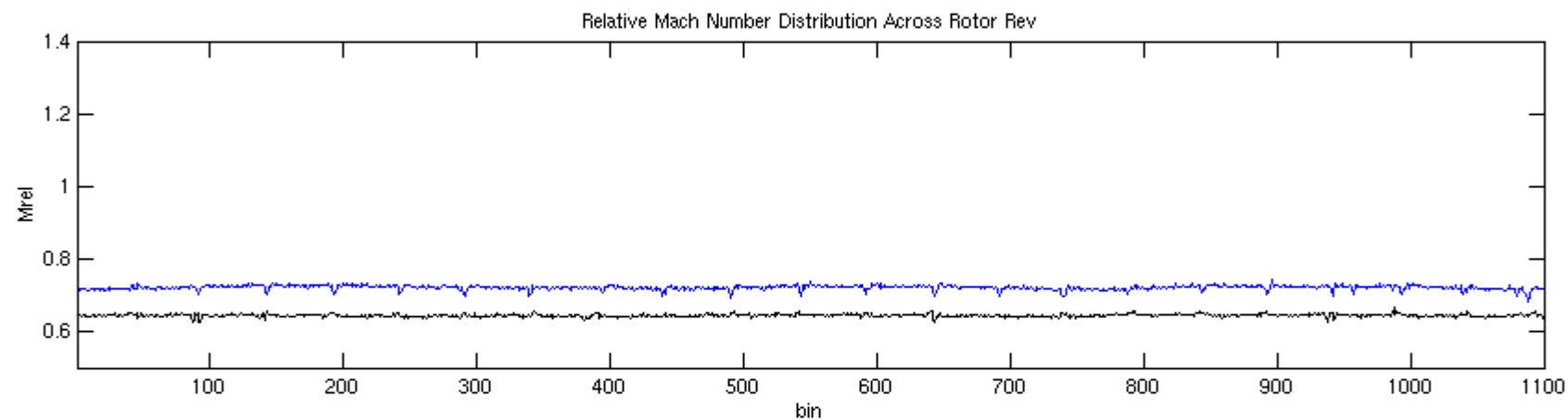
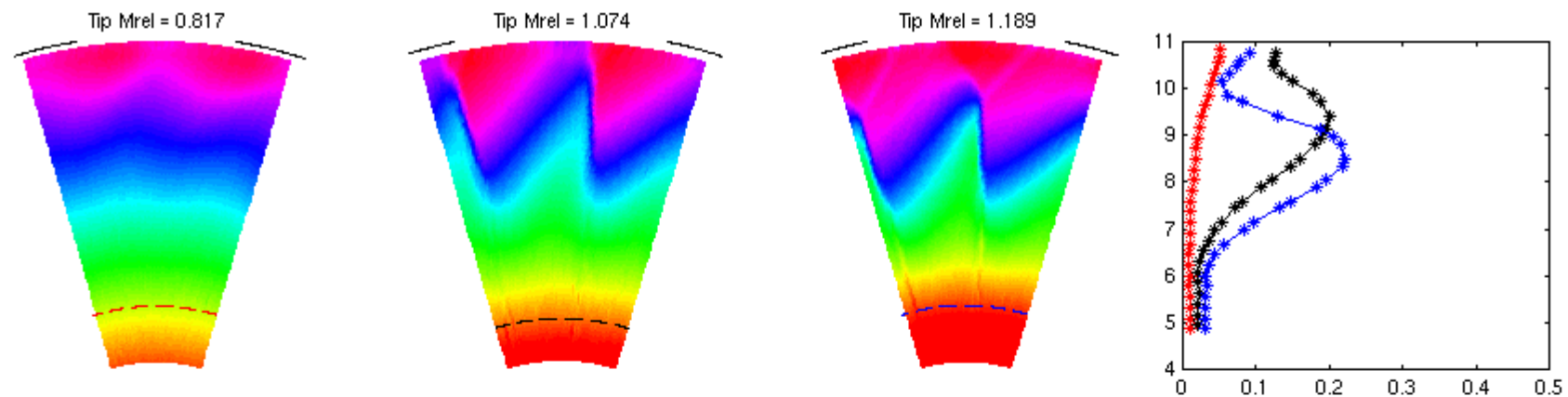


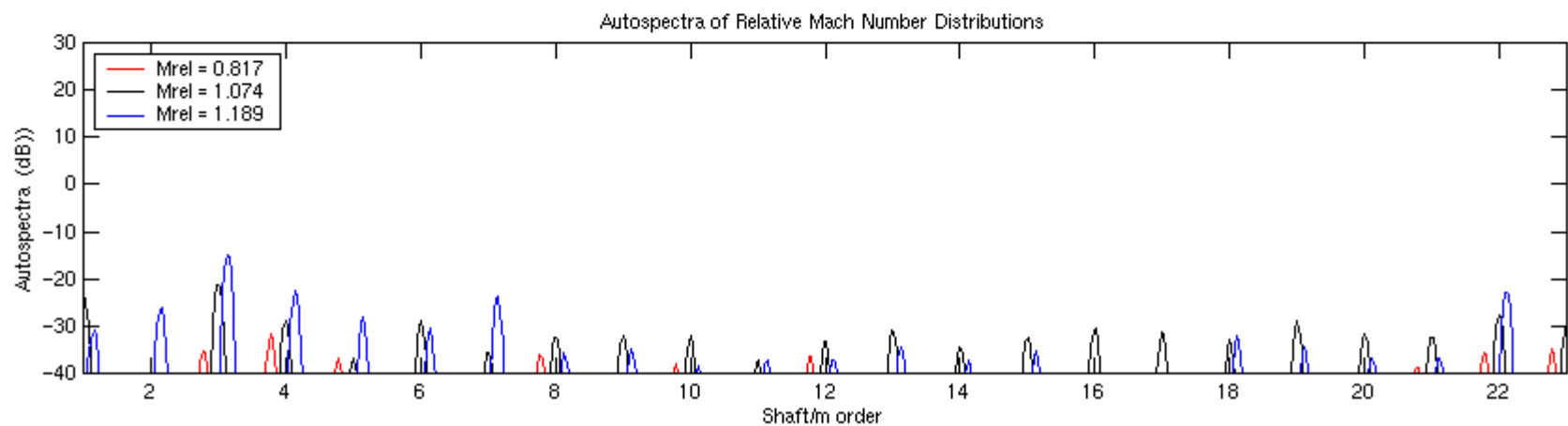
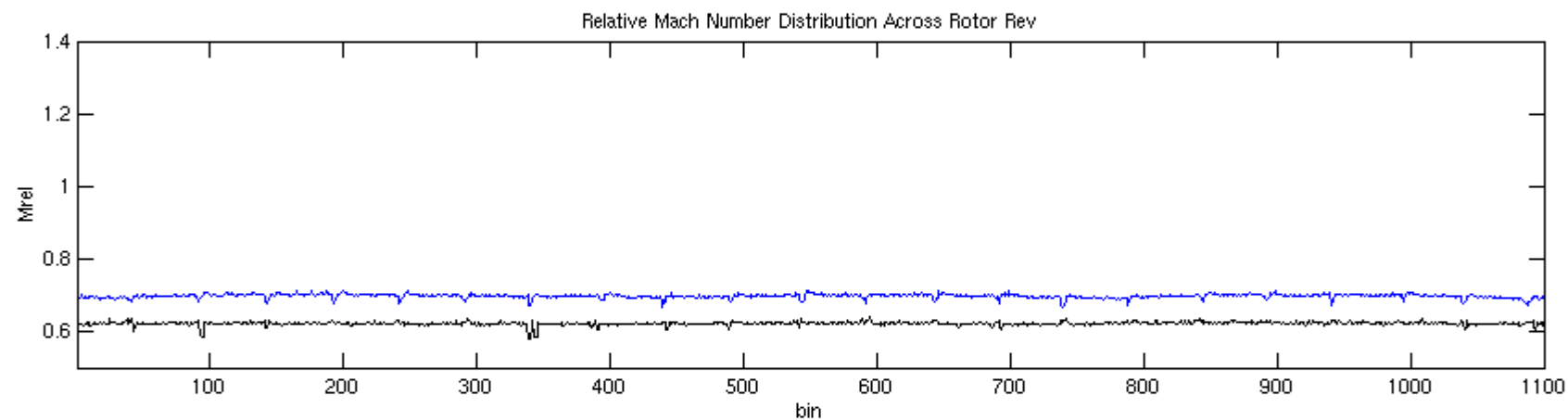
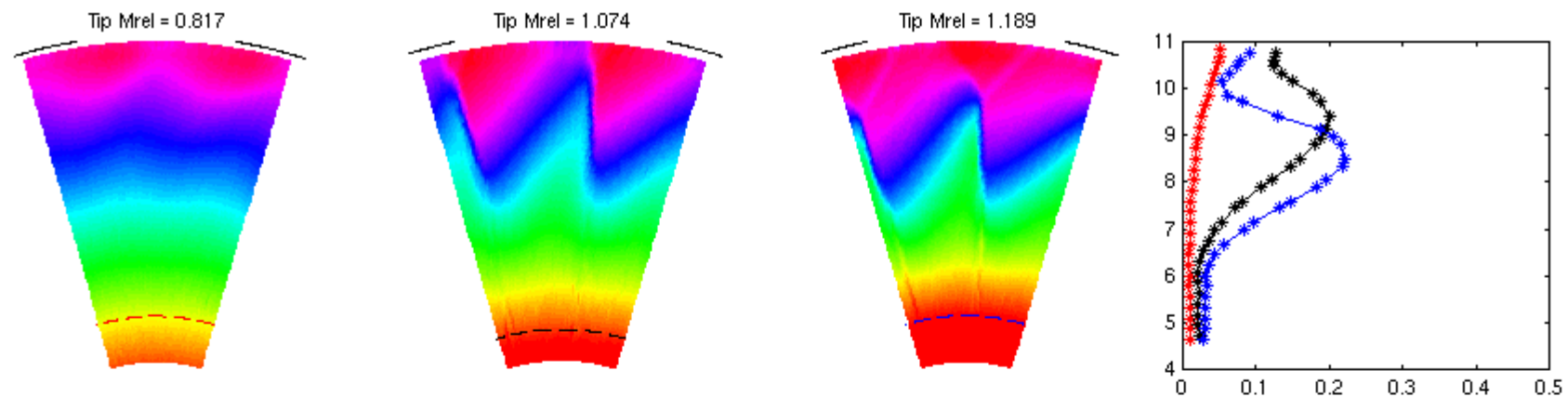


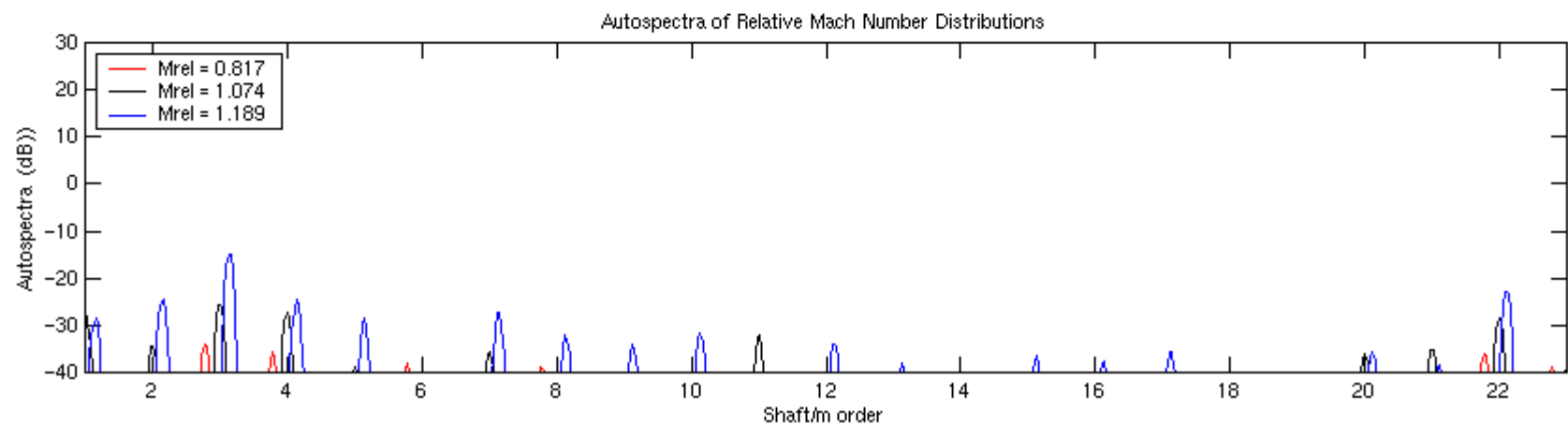
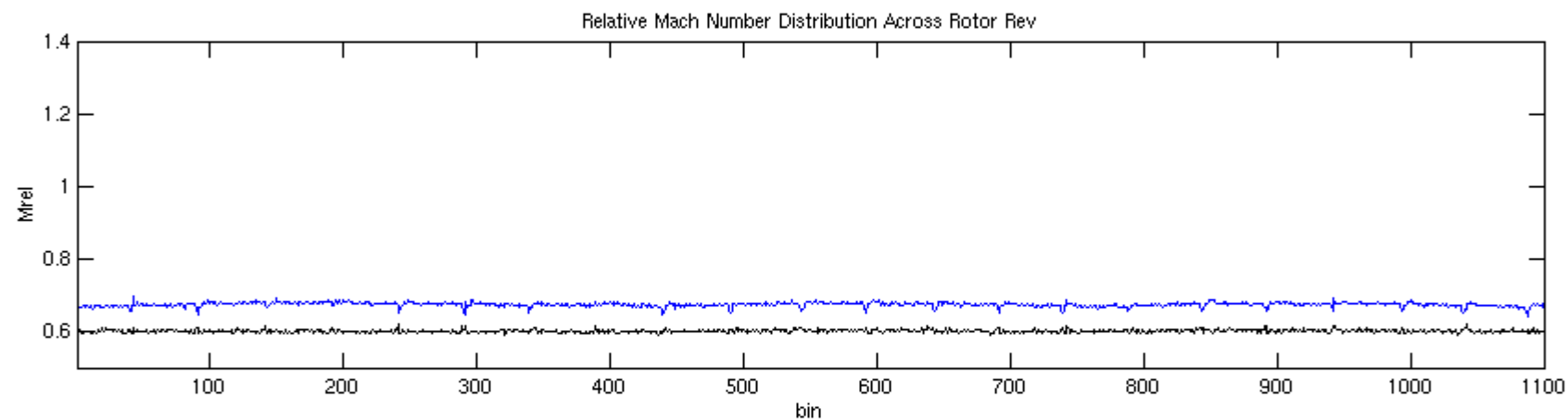
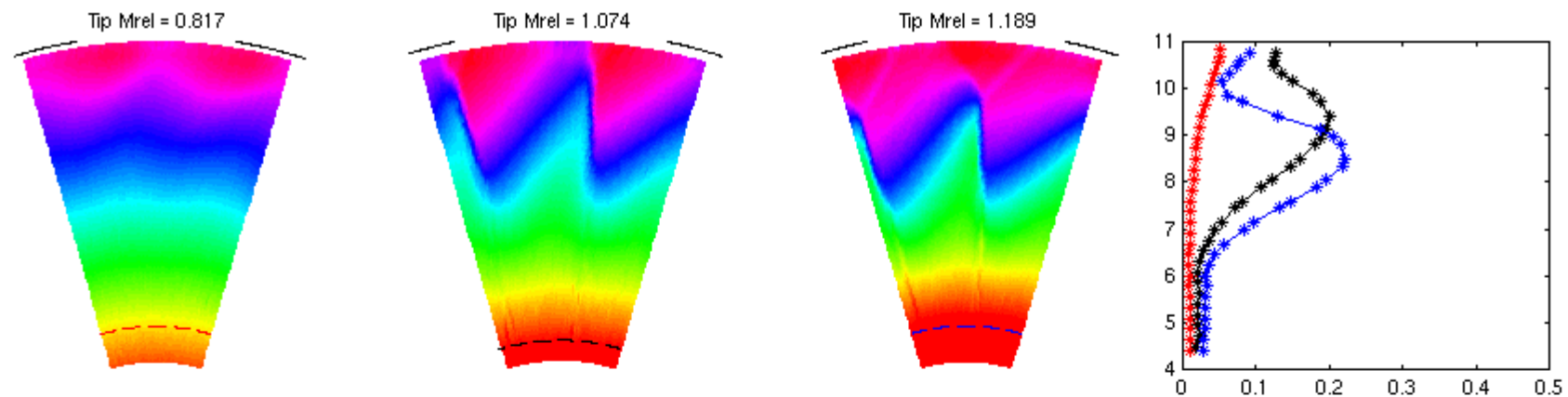


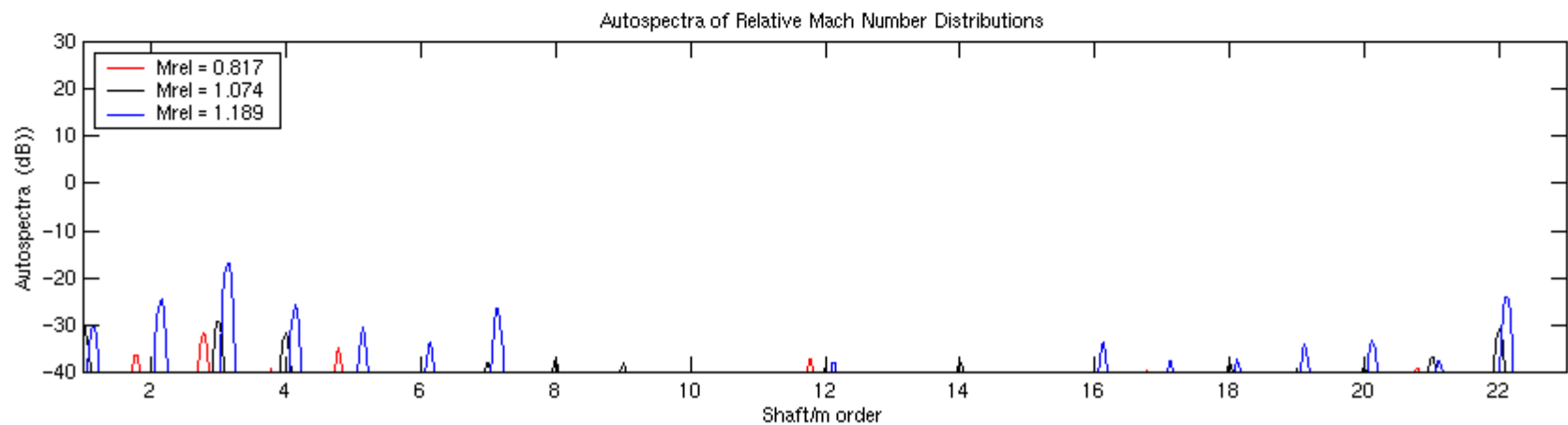
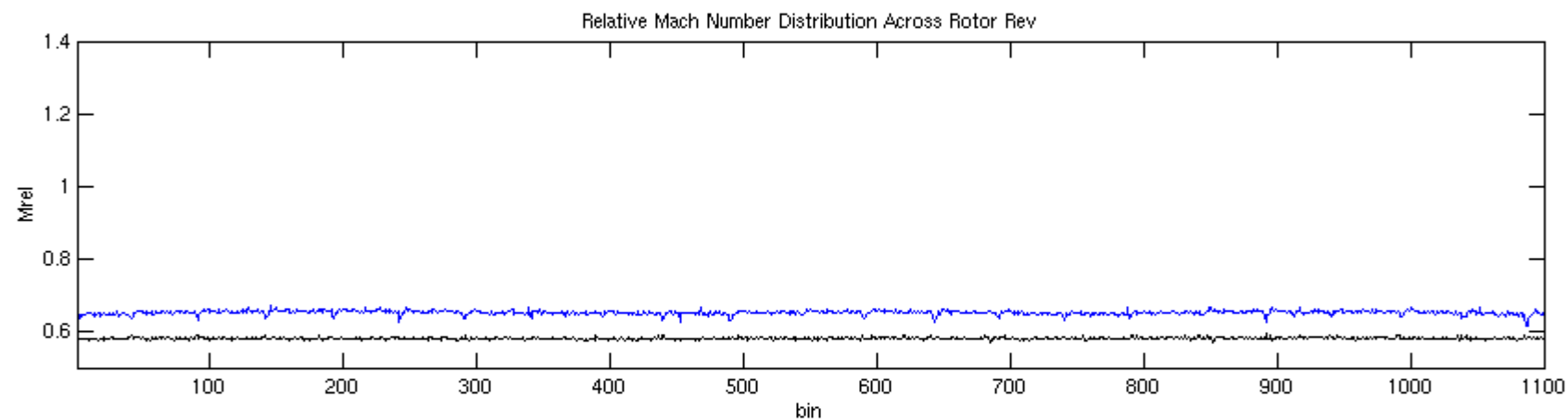
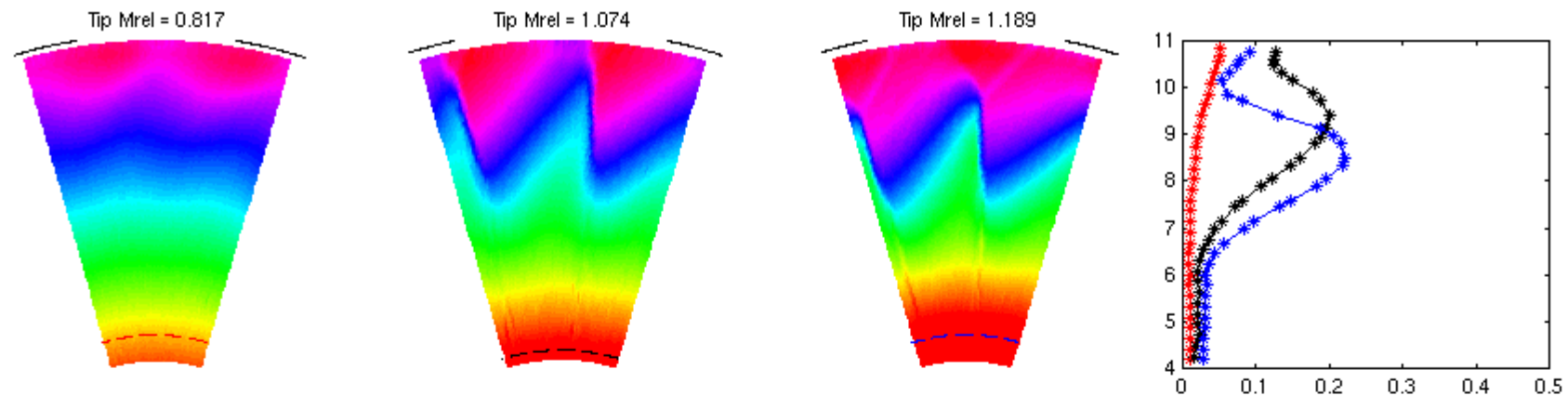












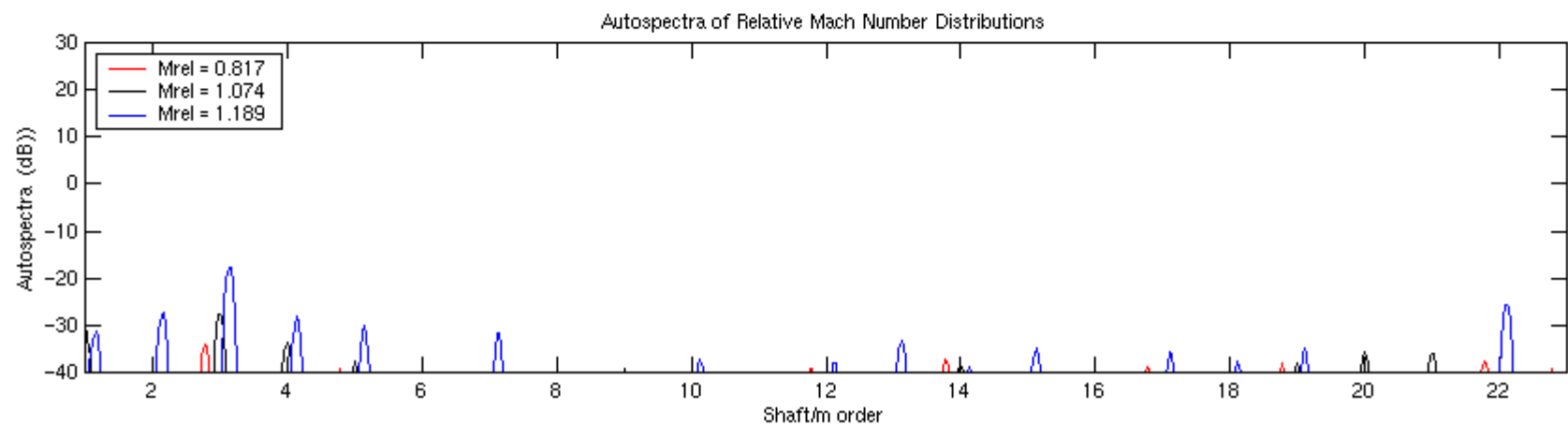
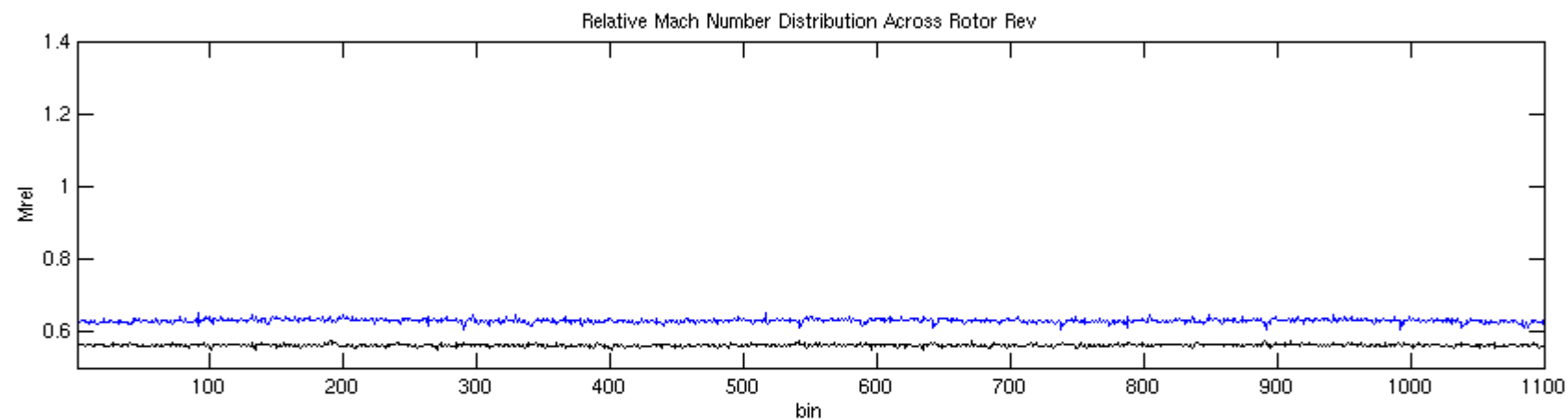
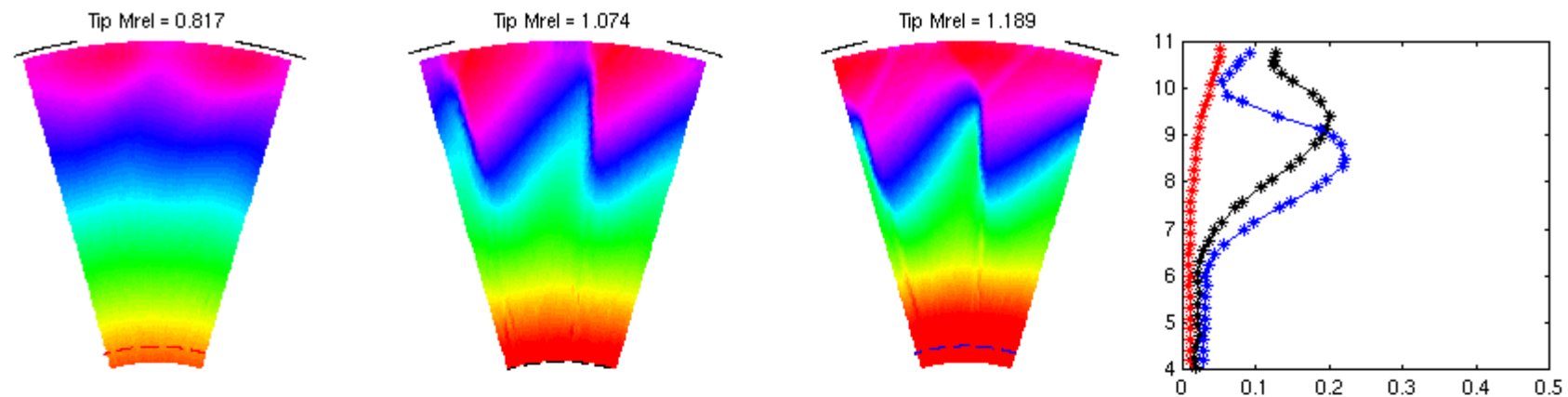


Figure 12.—The schematic at the left shows the measurement locations at which the data presented in figures 13 to 15 were obtained. These data were obtained via constant radial surveys made at $r = 10.6$ and $r = 8.5$ in. with the rotor operating at the high speed condition. The plot at the right shows where these radial surveys would cut through the flow measured at axial station 1. The $r = 10.6$ in. survey was made upstream of where the passage shock was swallowed. The $r = 8.5$ in. location corresponds to where the shock was expelled and was at its maximum strength.

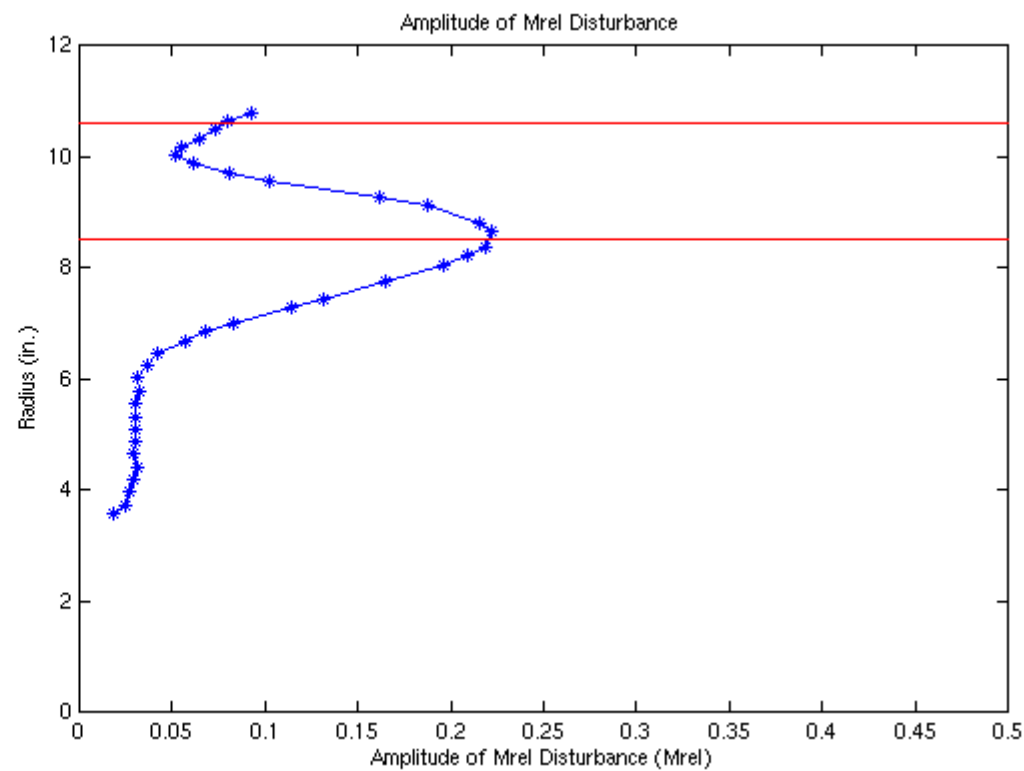
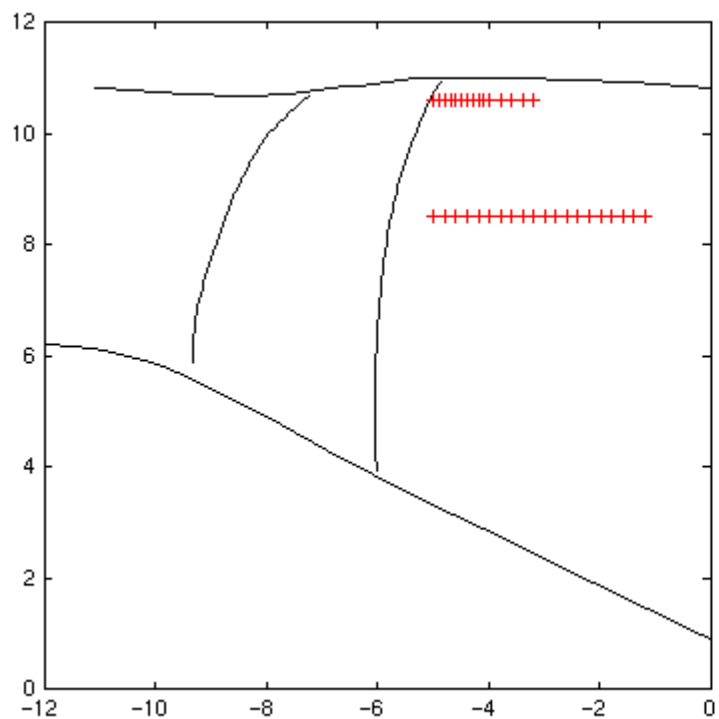
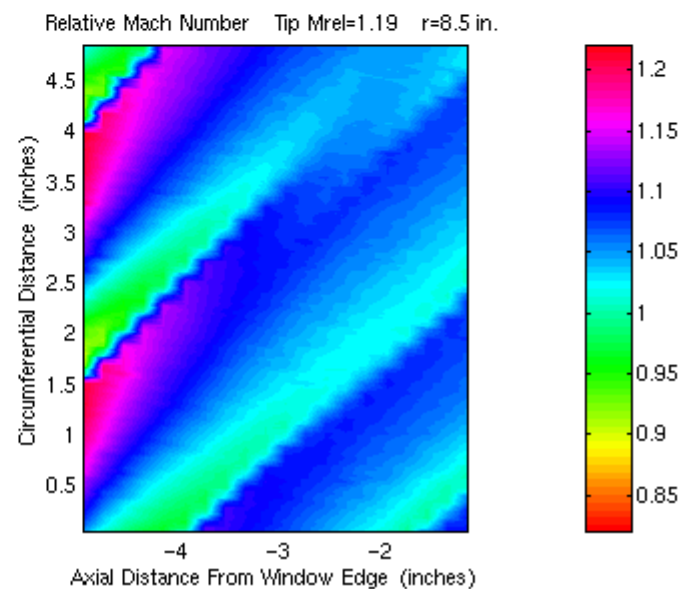
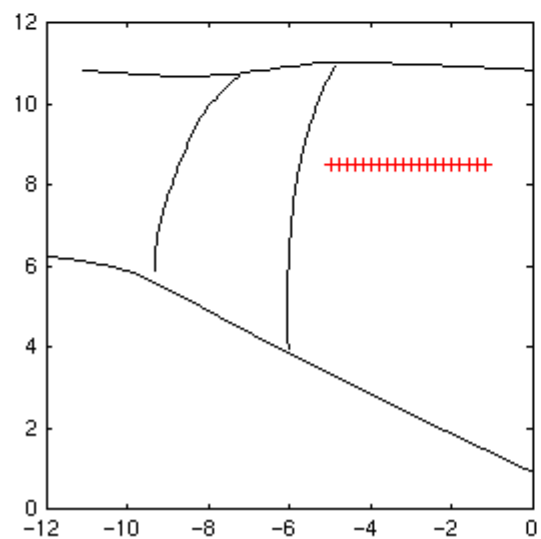
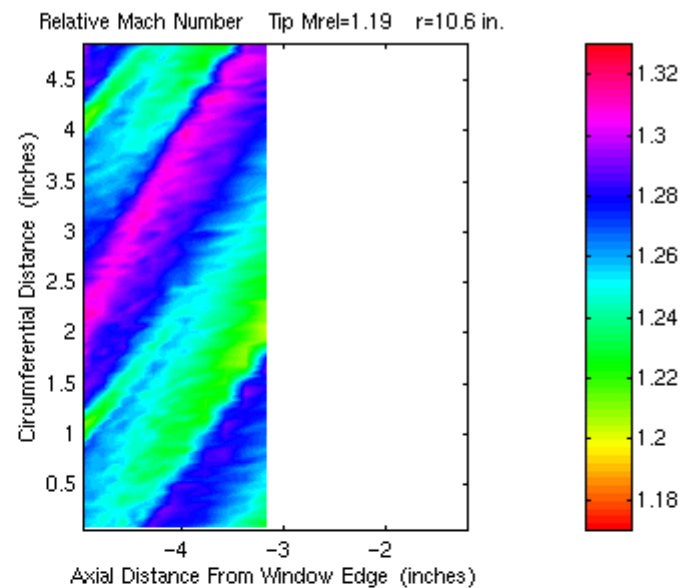
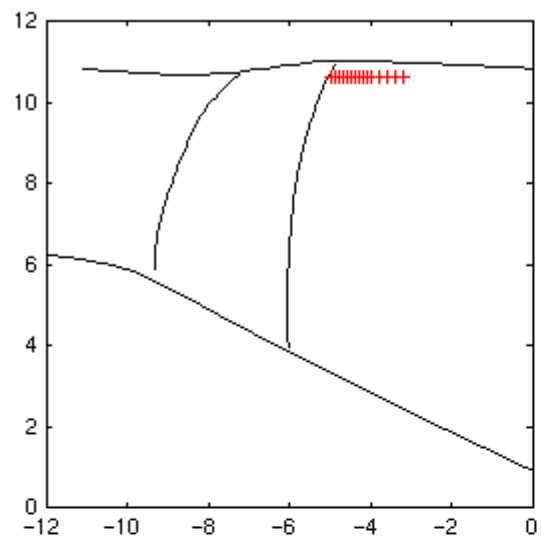
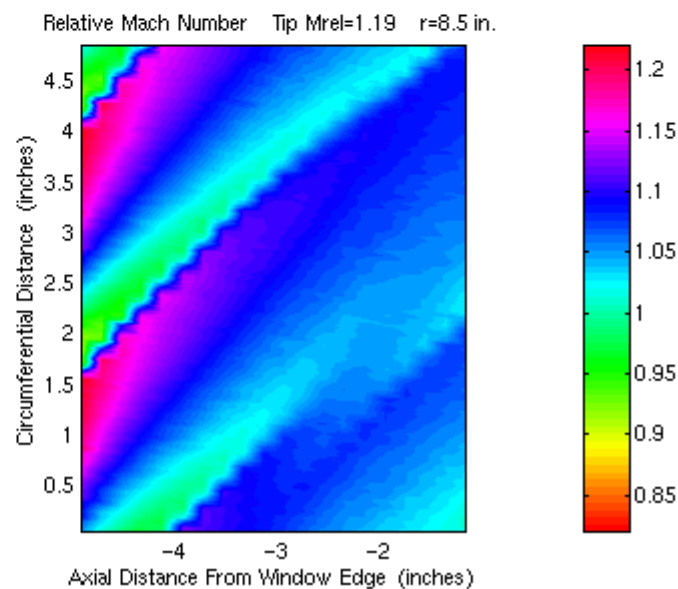
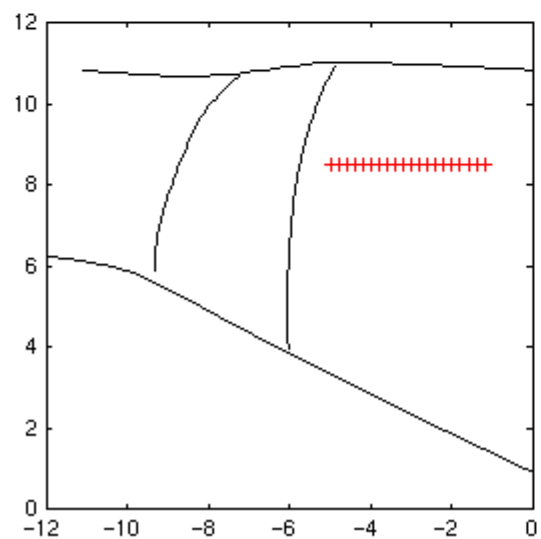
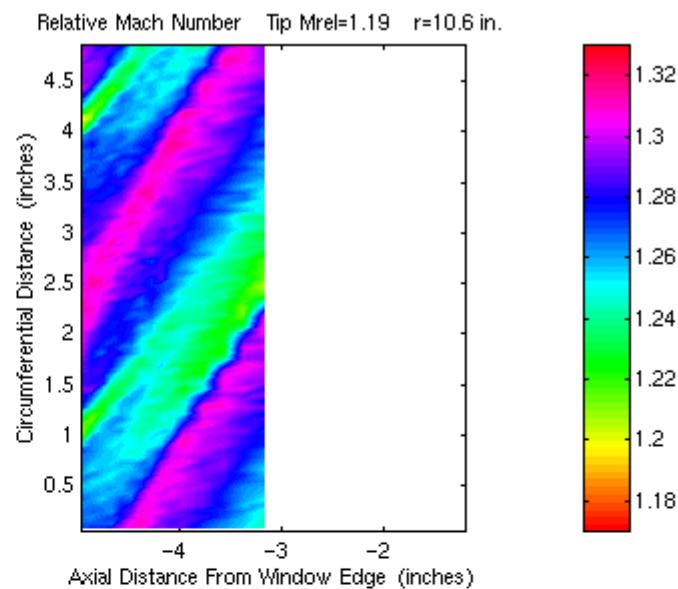
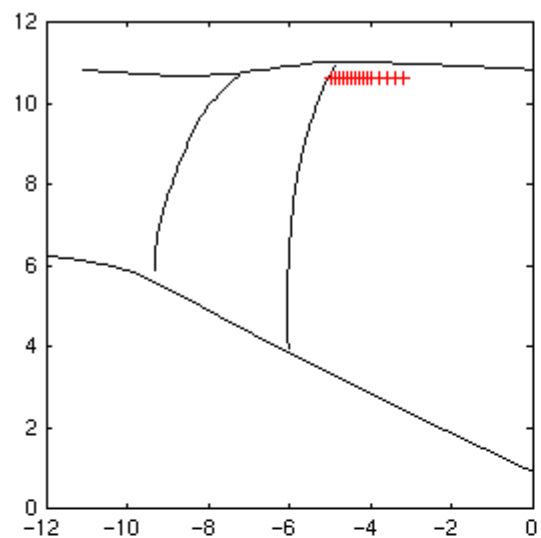
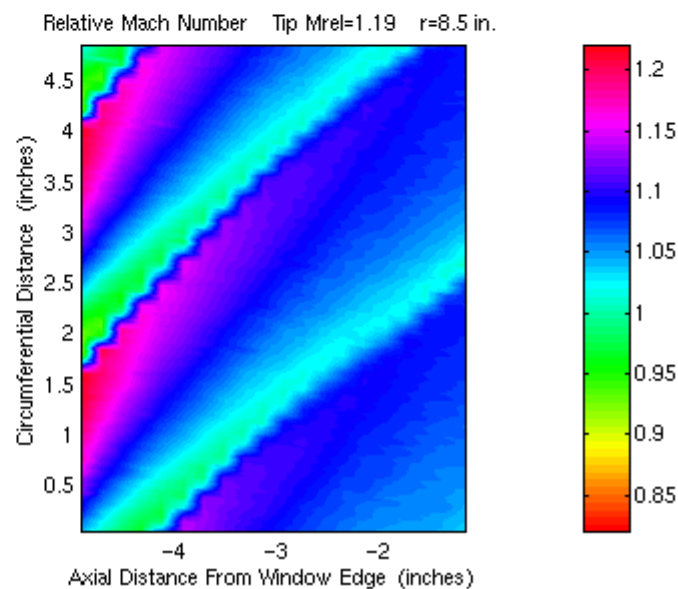
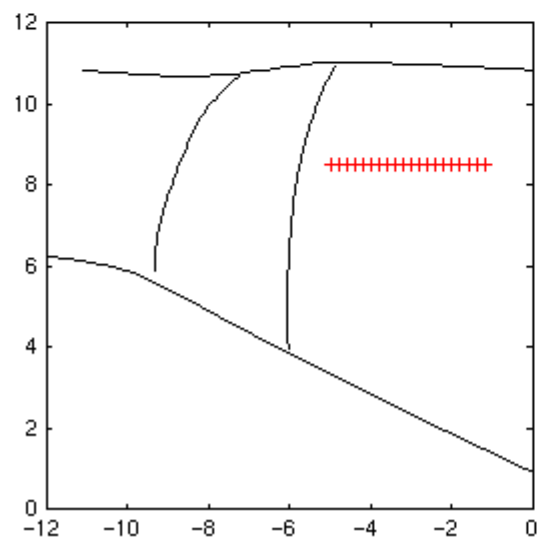
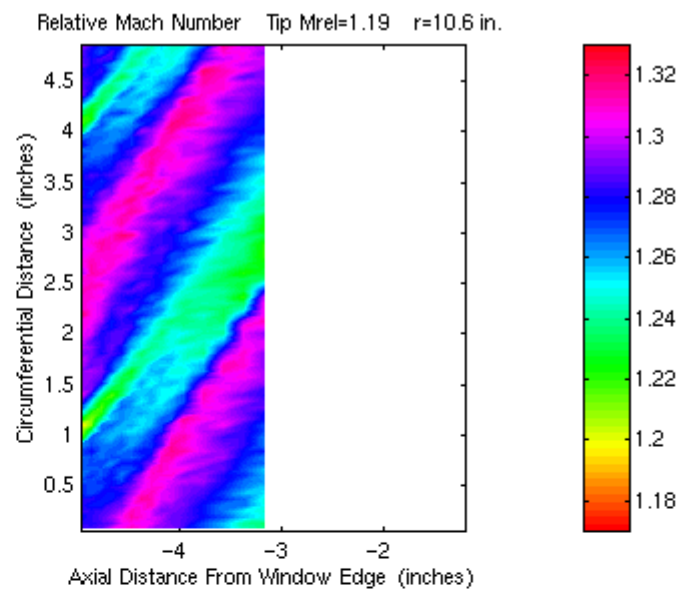
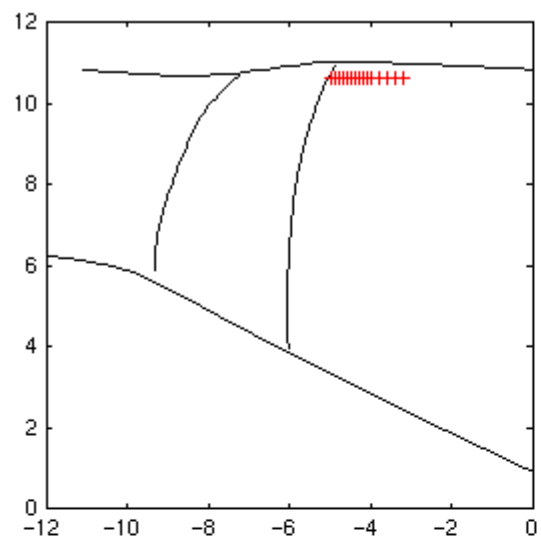
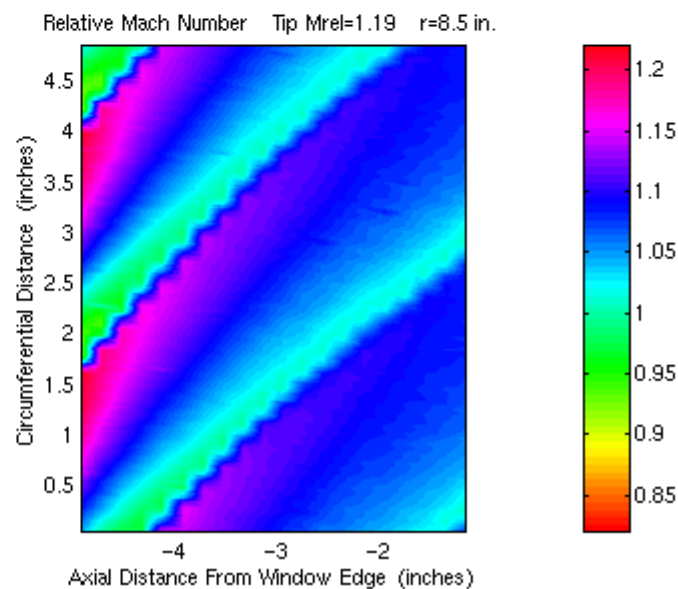
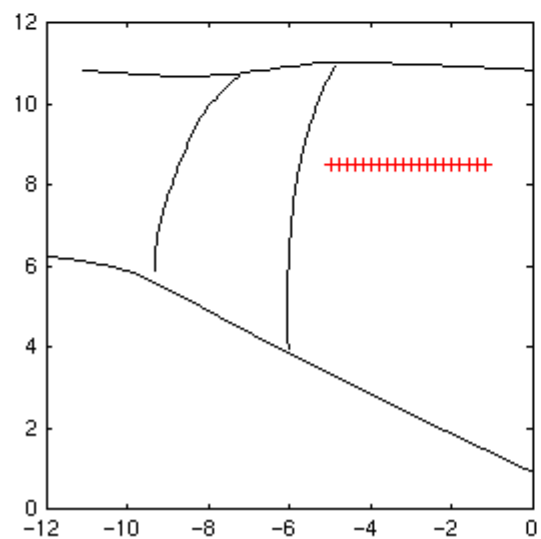
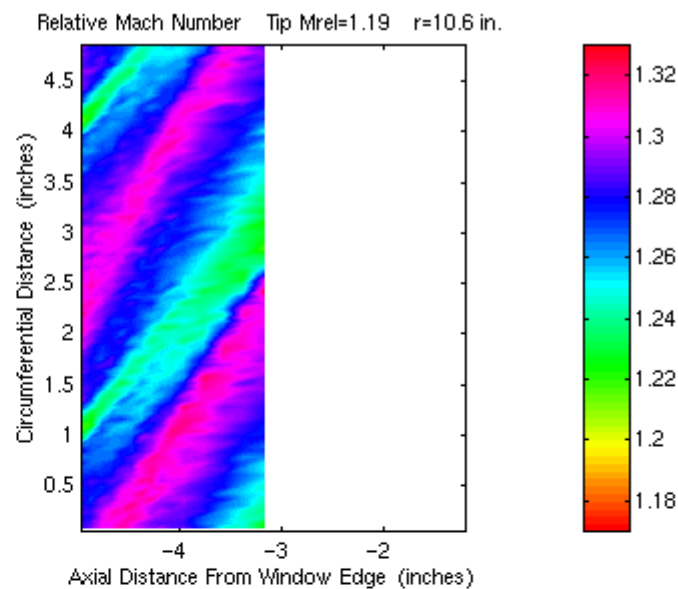
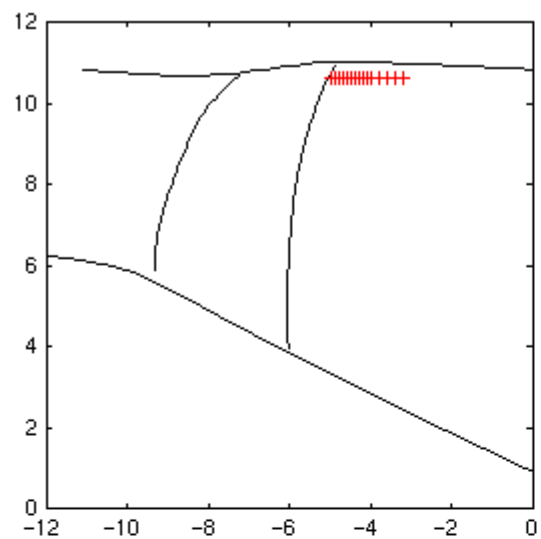


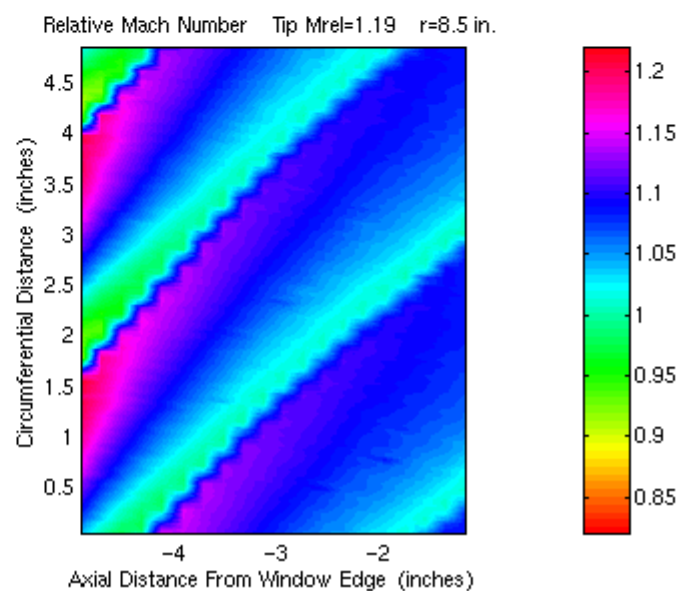
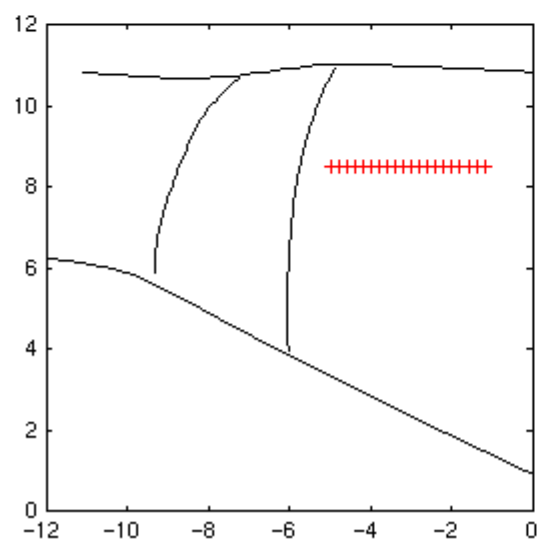
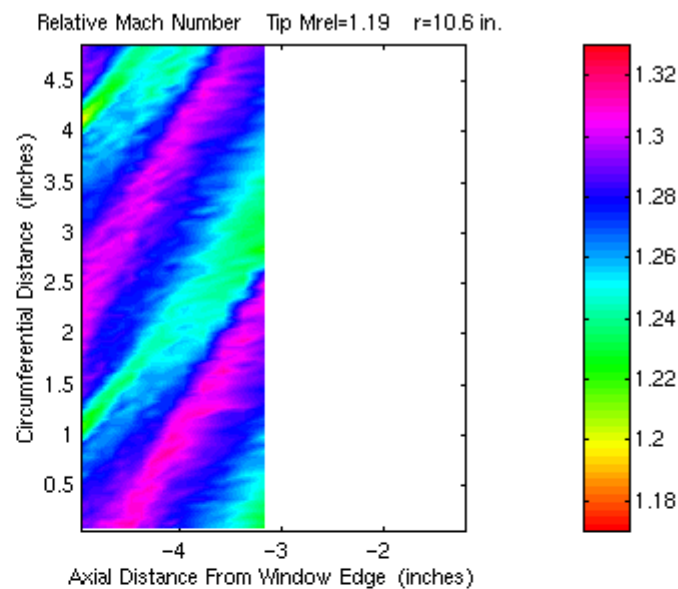
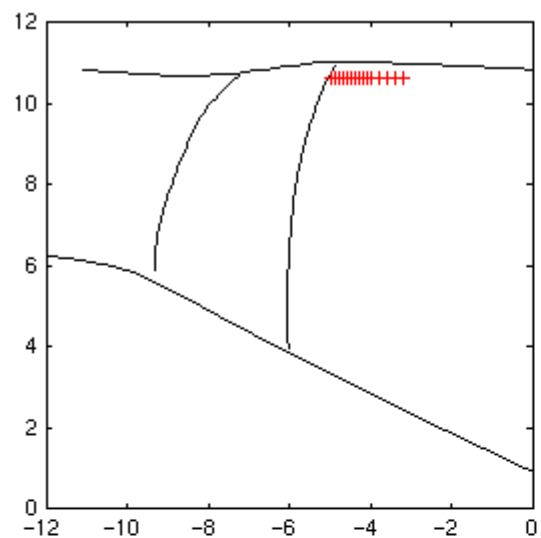
Figure 13. Slideshow (22 slides) illustrating the blade-to-blade variations in the flow measured upstream of the forward-swept fan at $r = 10.6$ in. (top contours) and $r = 8.5$ in. (bottom) with the rotor operating at the high speed condition. On each successive slide a new blade passage of data is rotated into view.

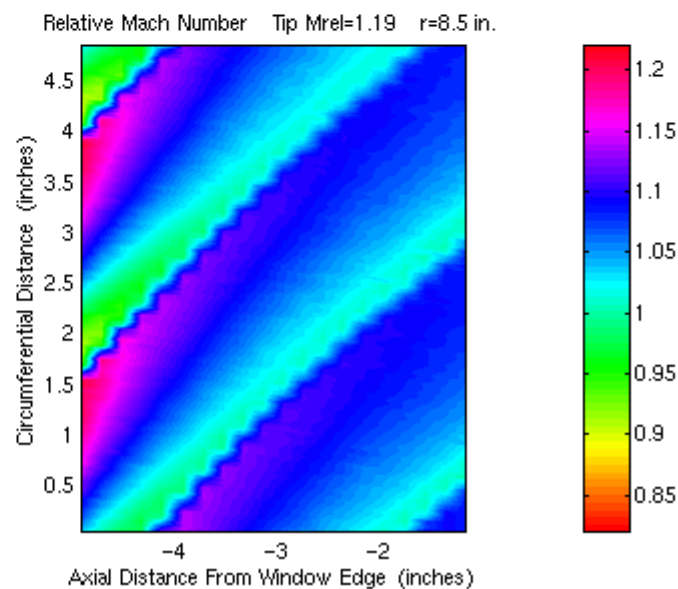
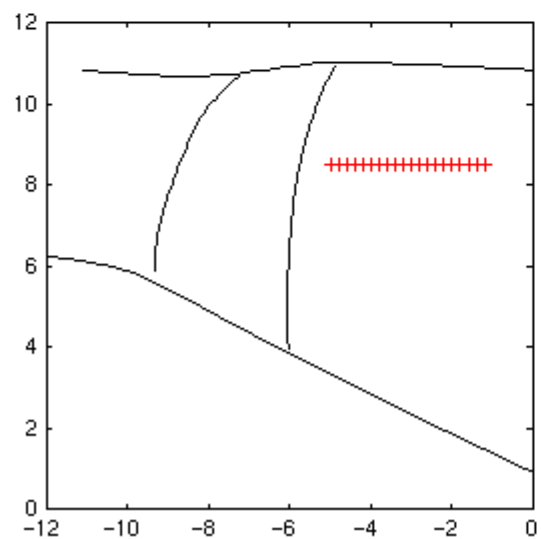
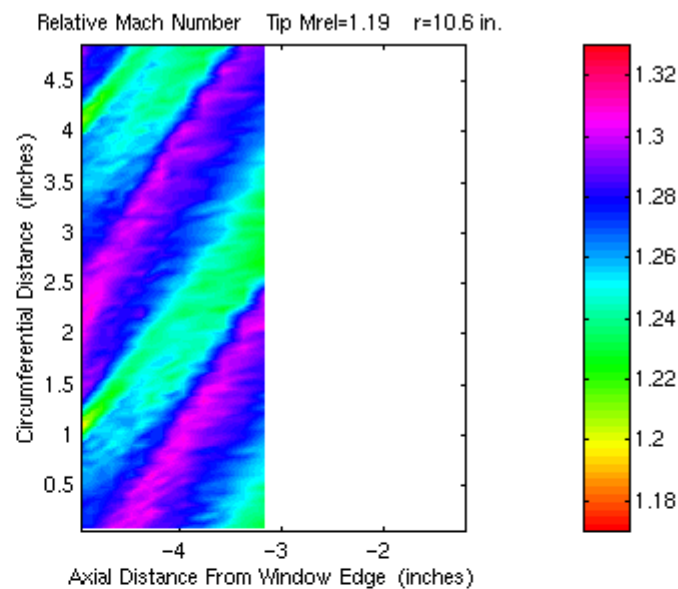
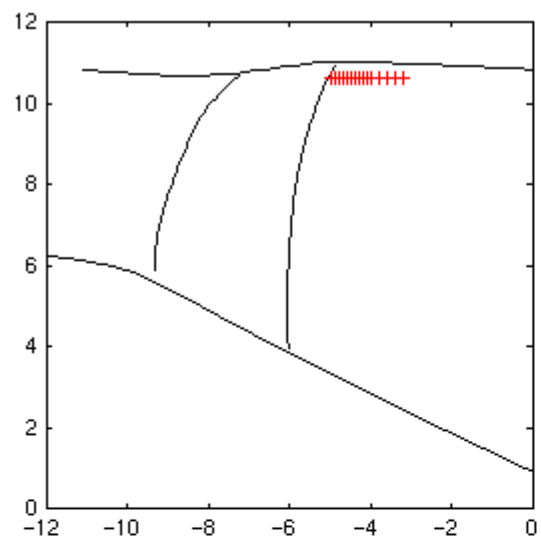


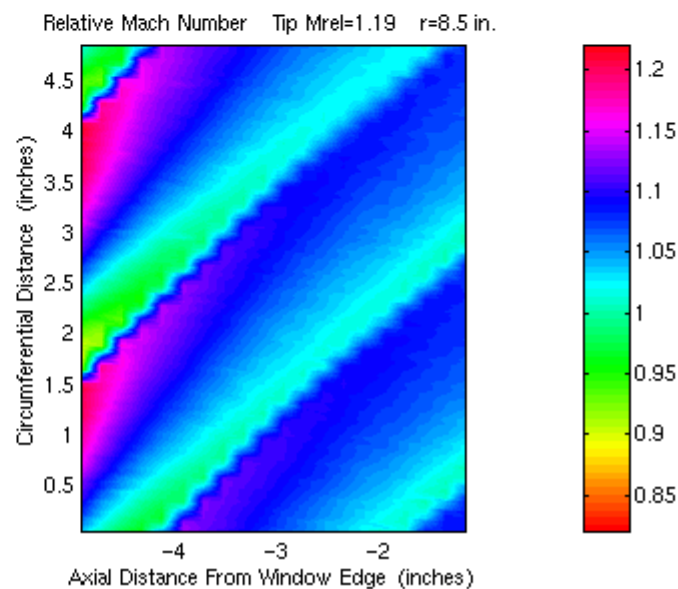
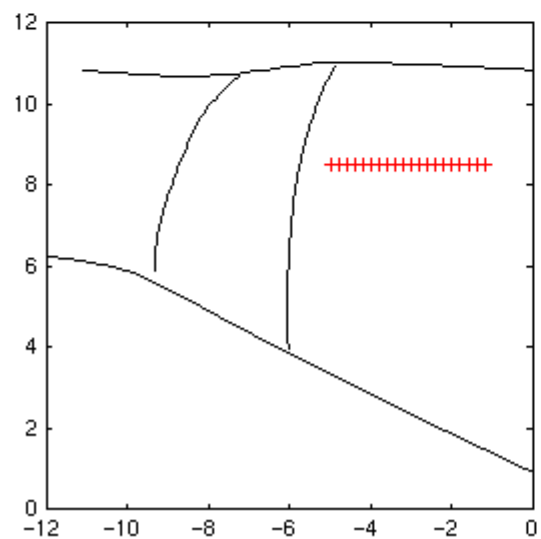
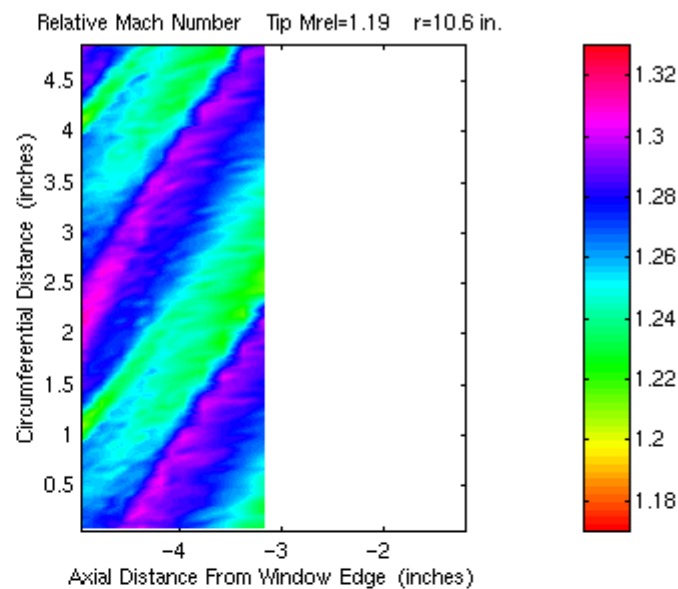
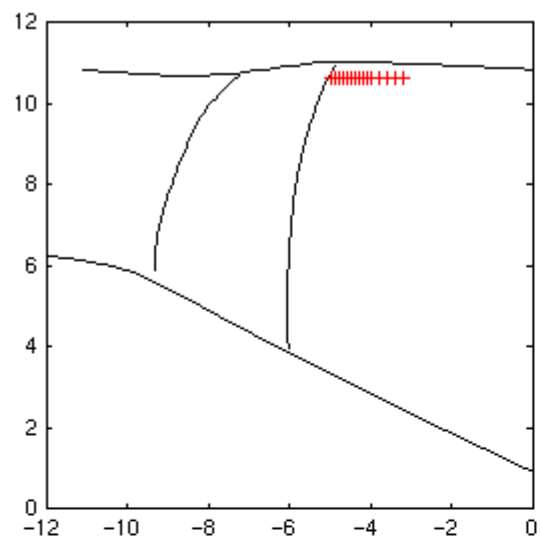


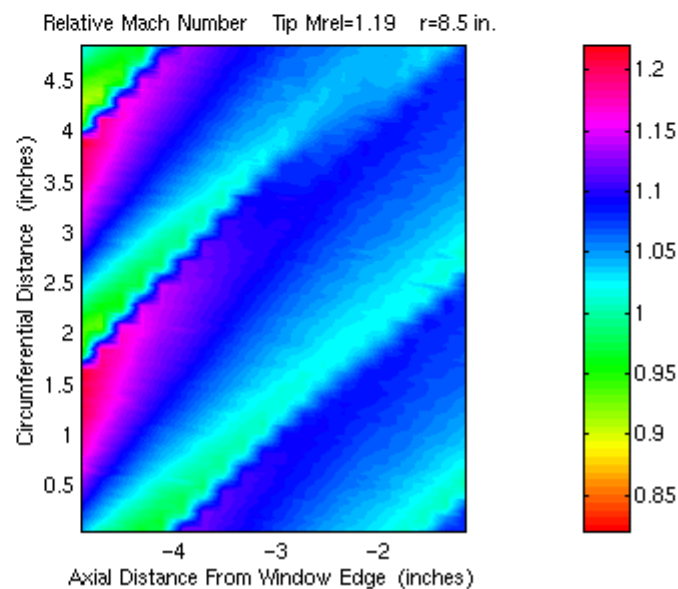
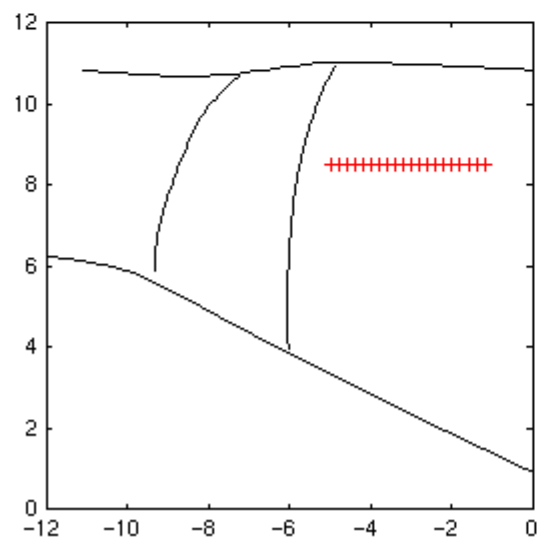
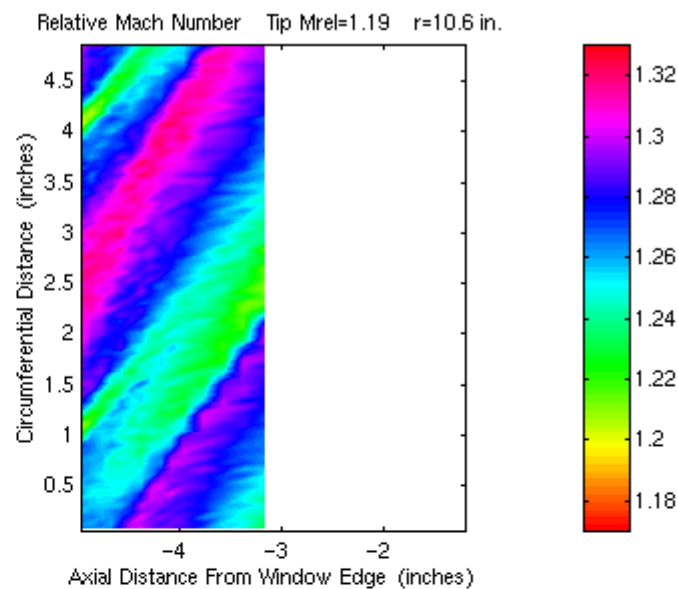
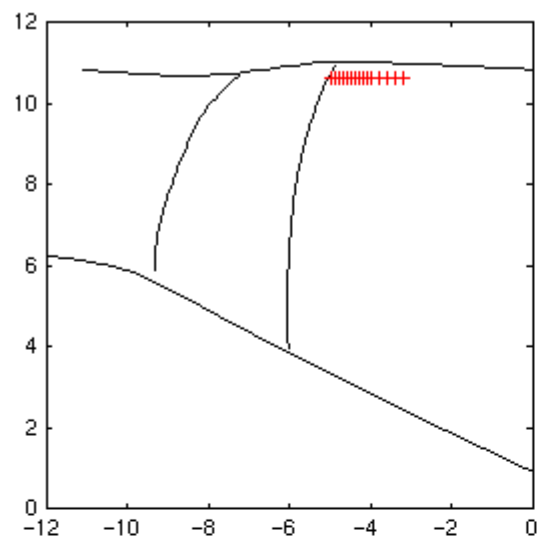


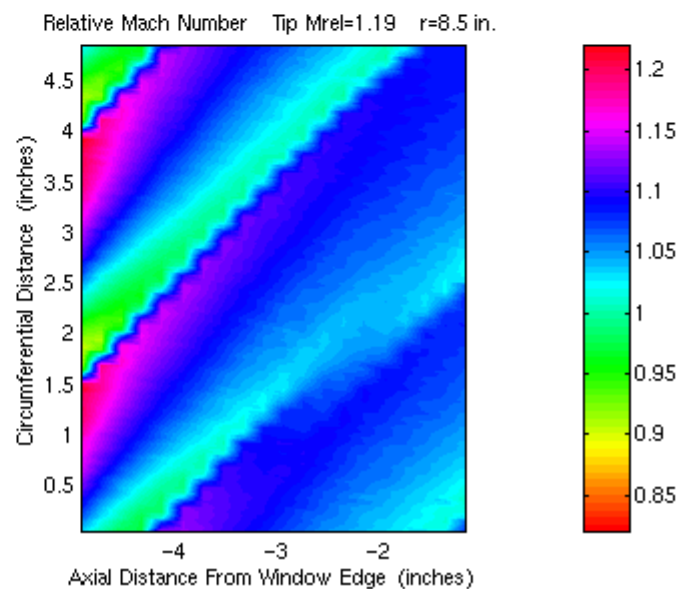
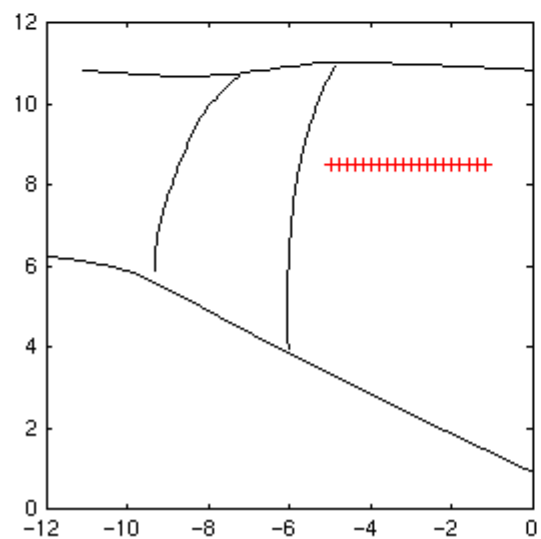
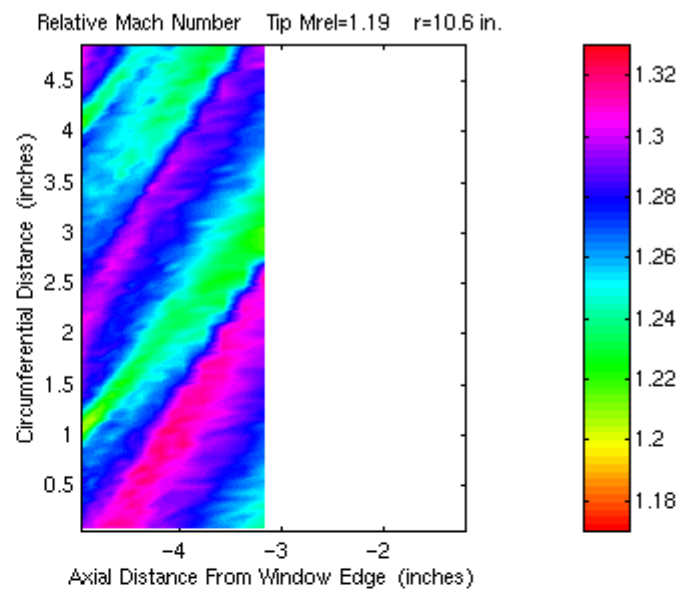
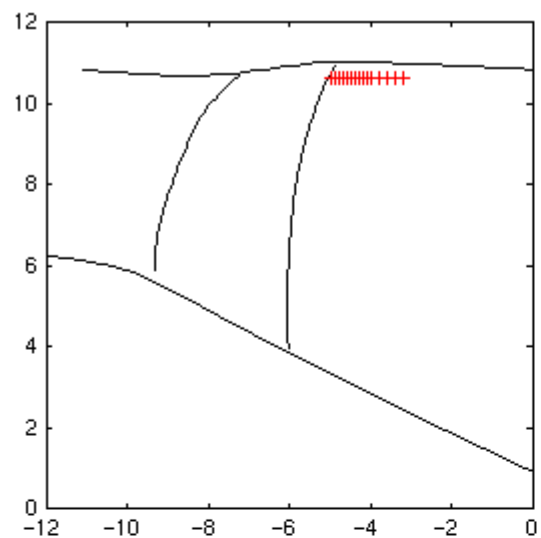


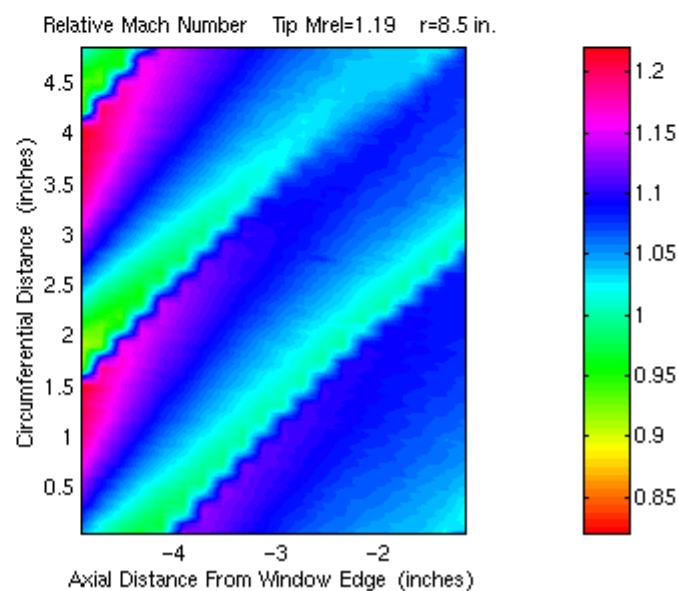
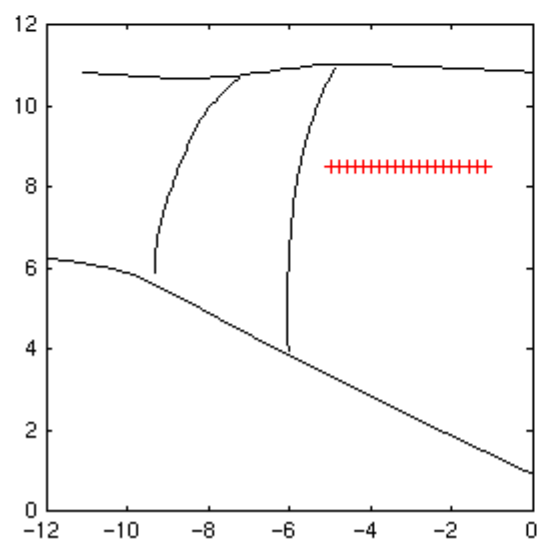
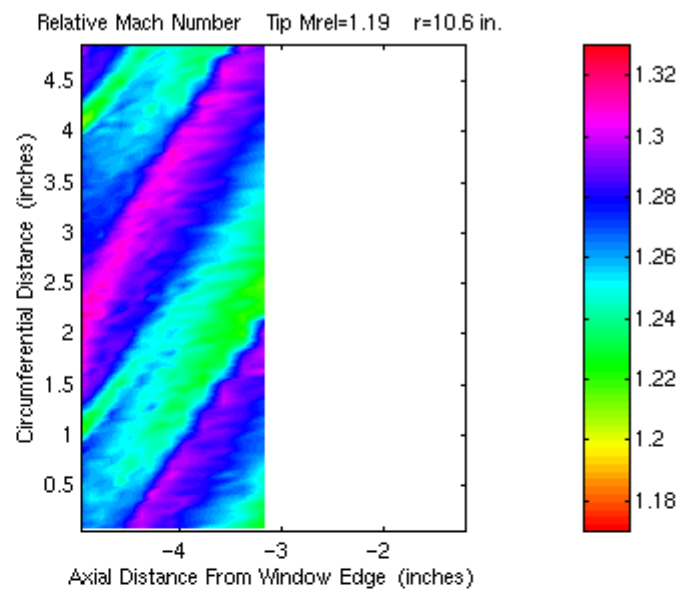
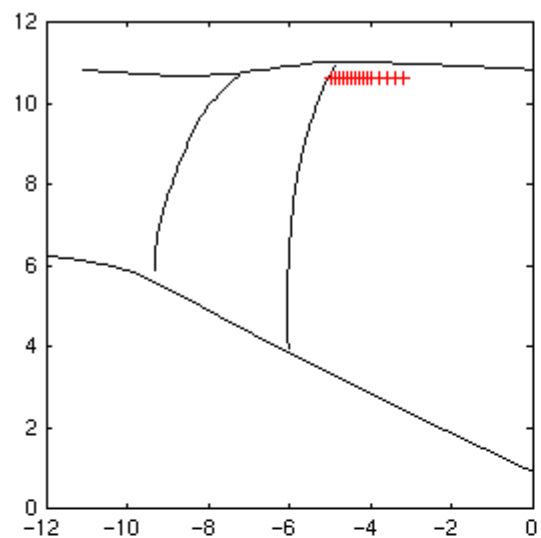


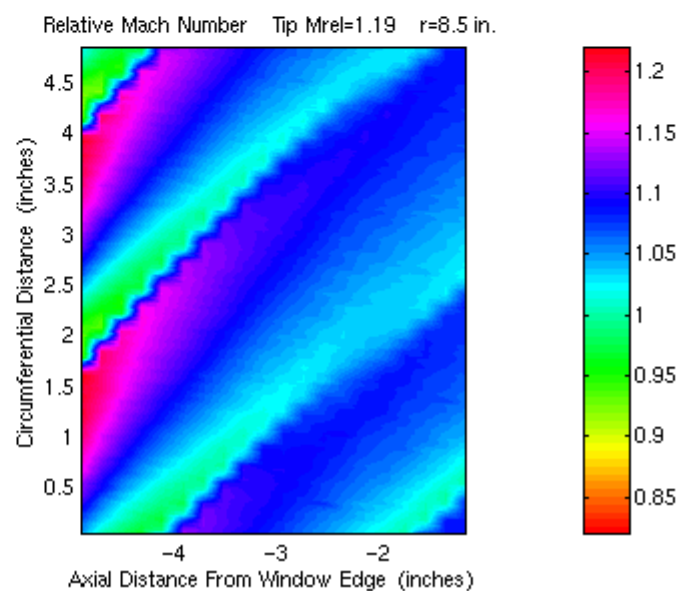
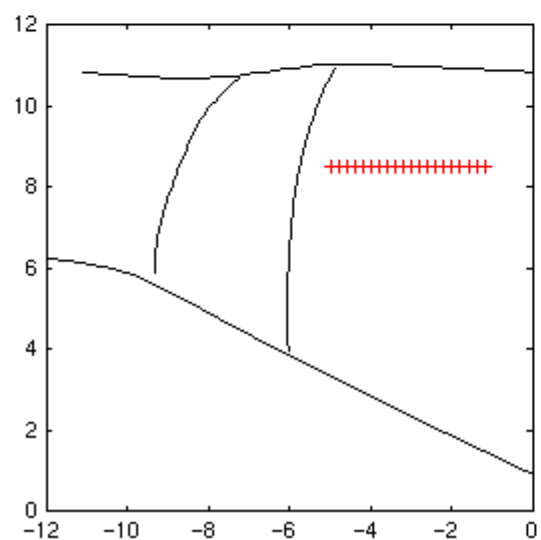
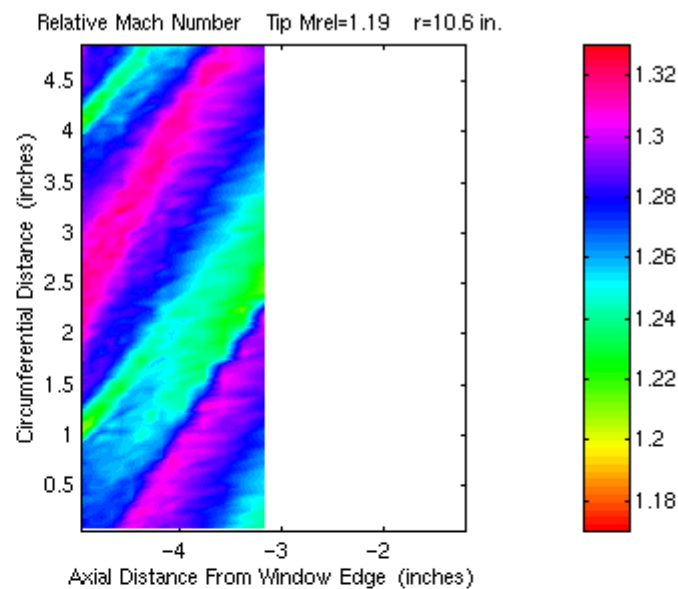
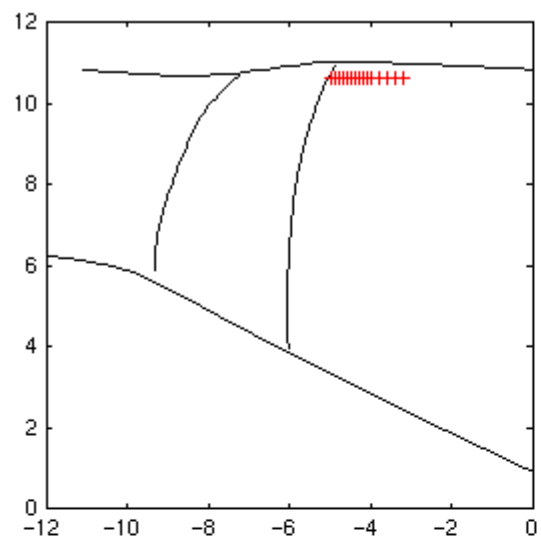


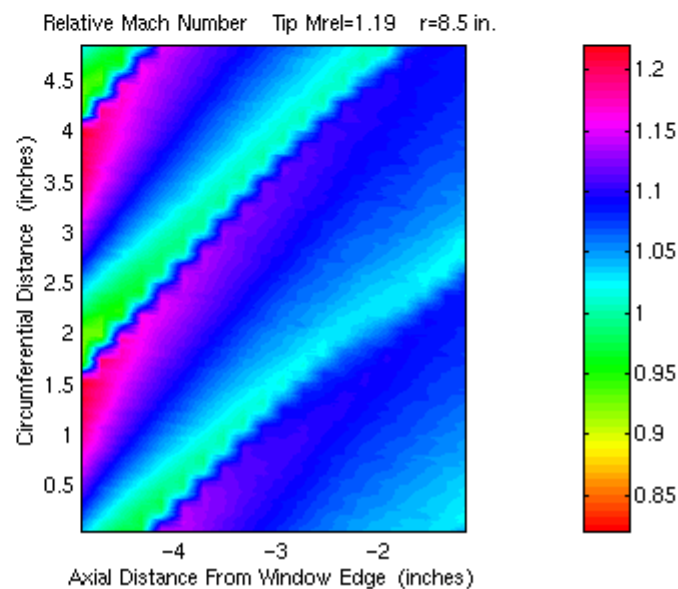
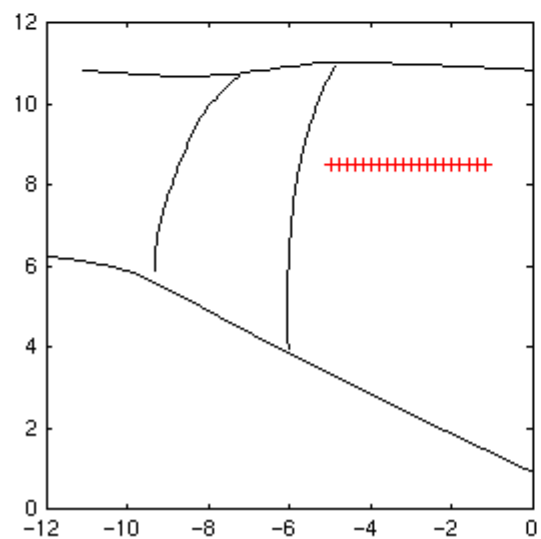
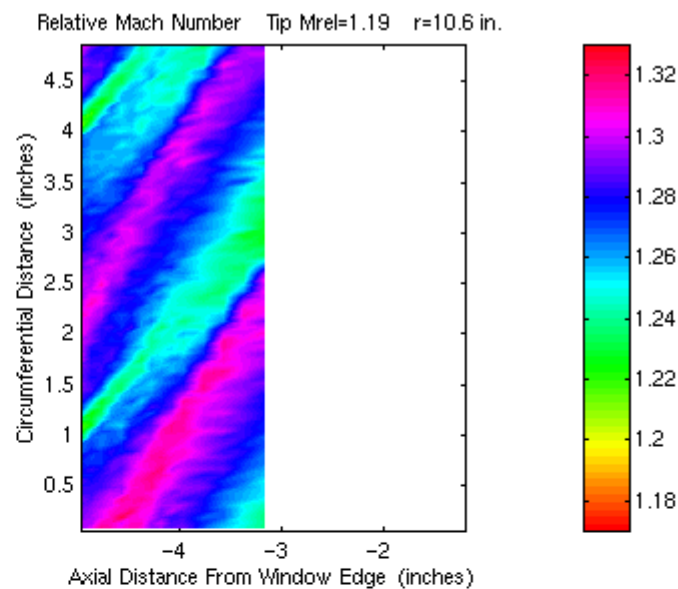
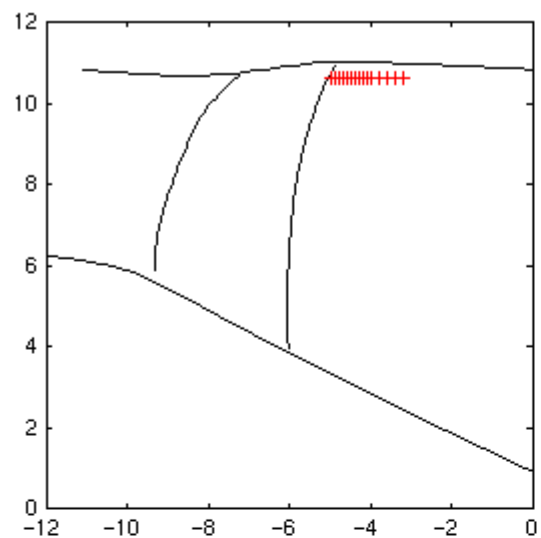


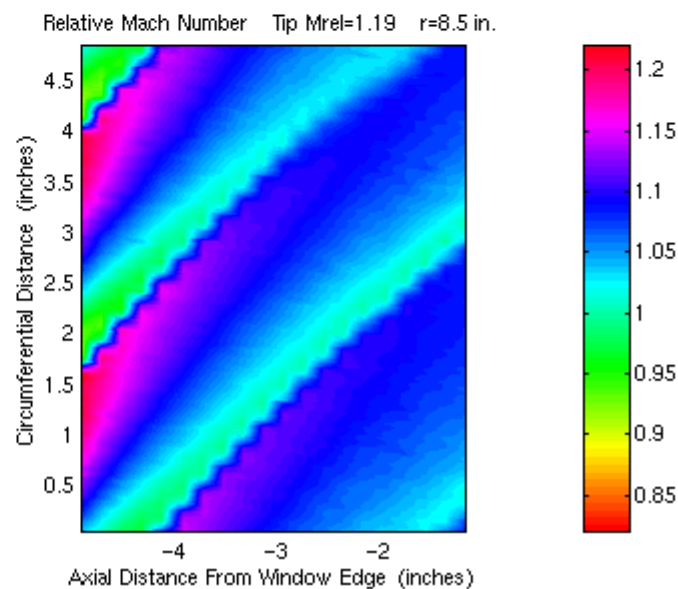
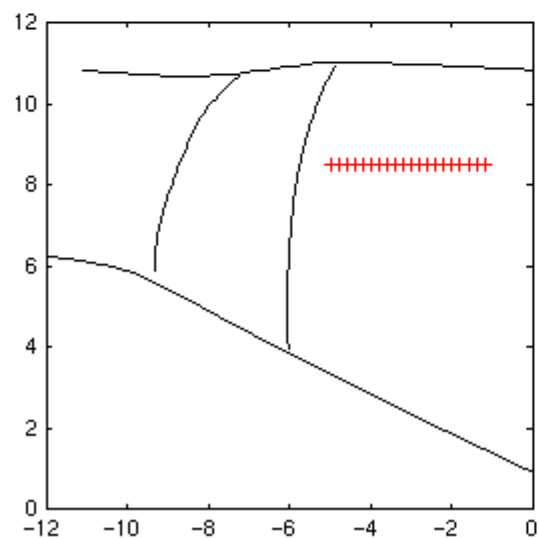
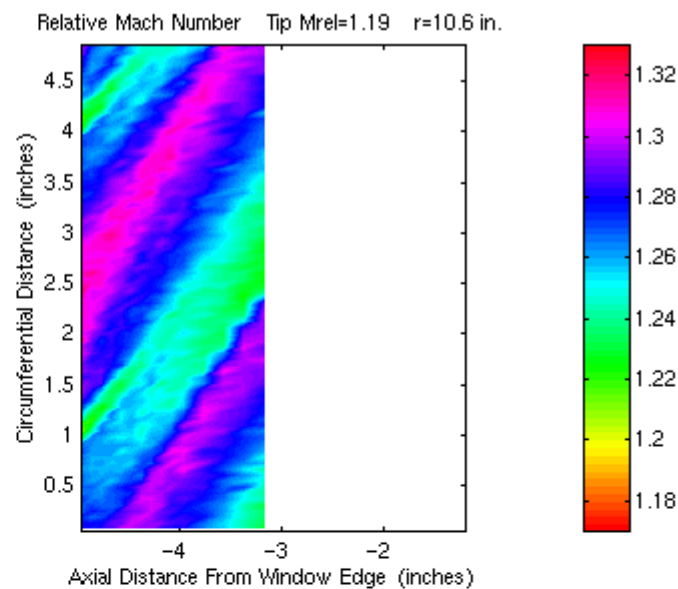
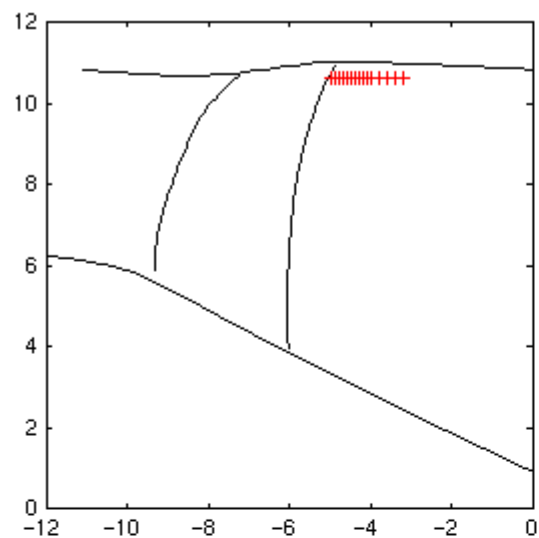


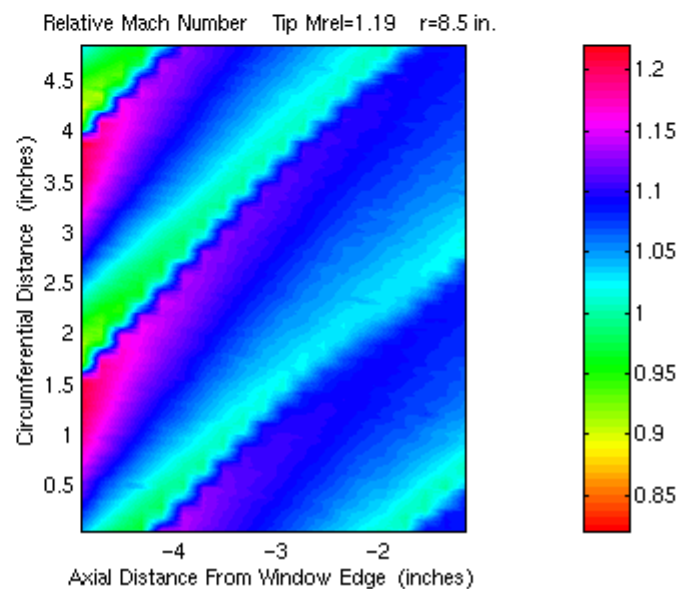
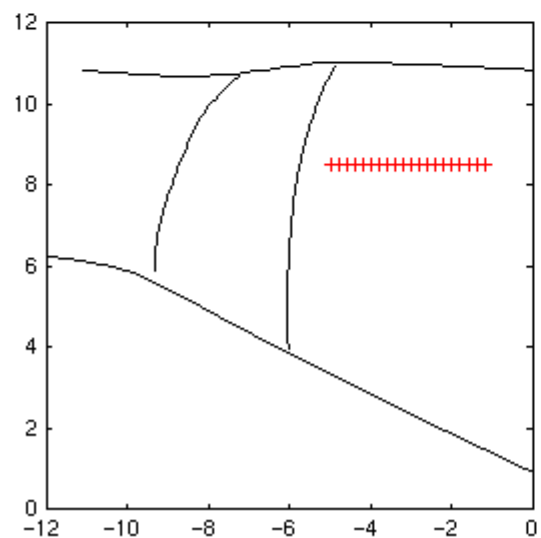
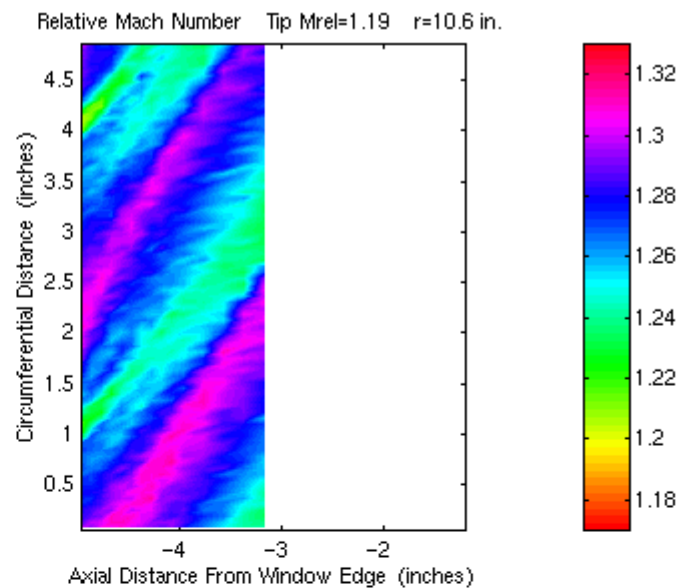
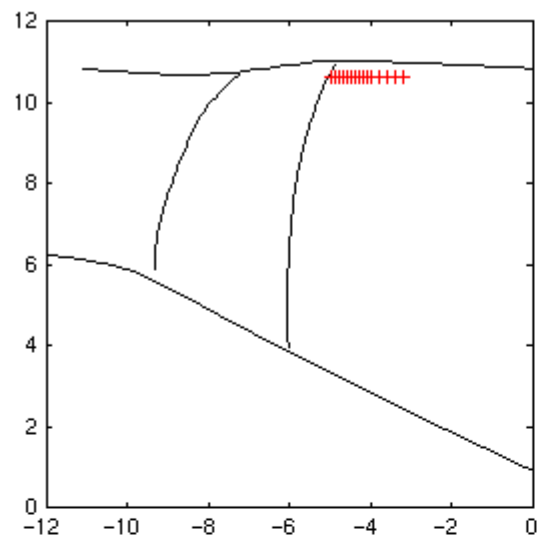


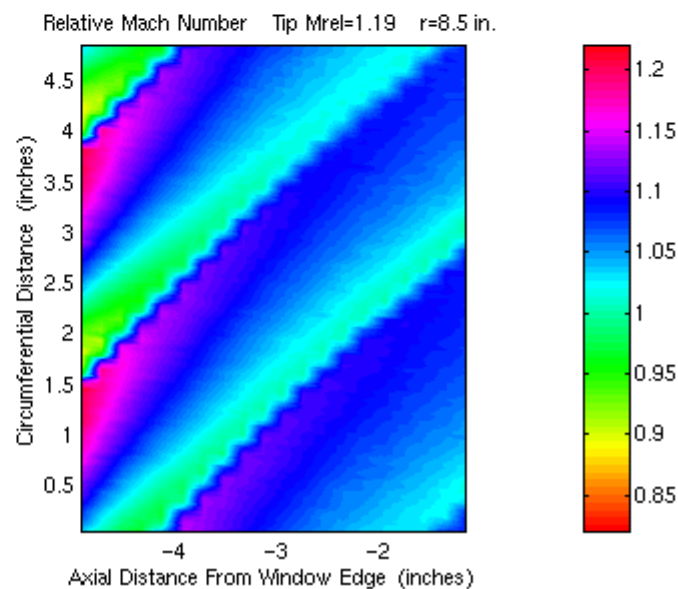
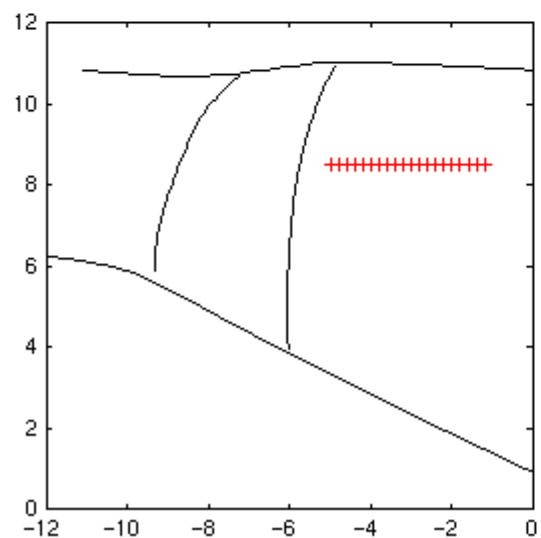
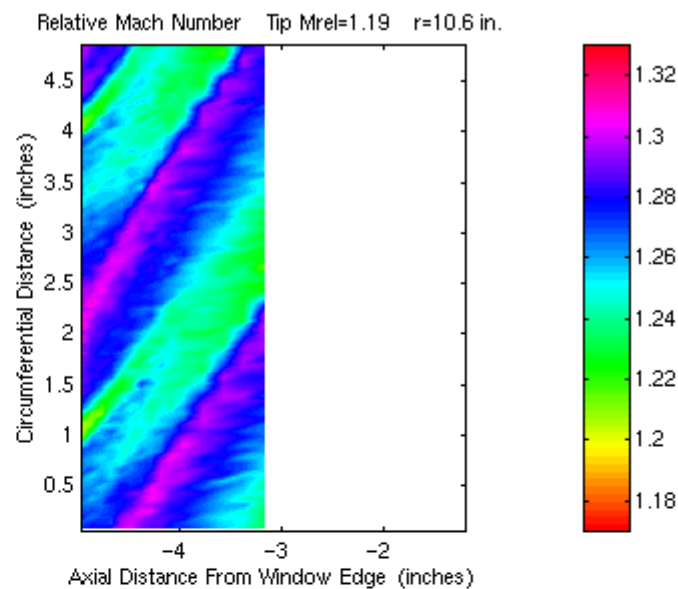
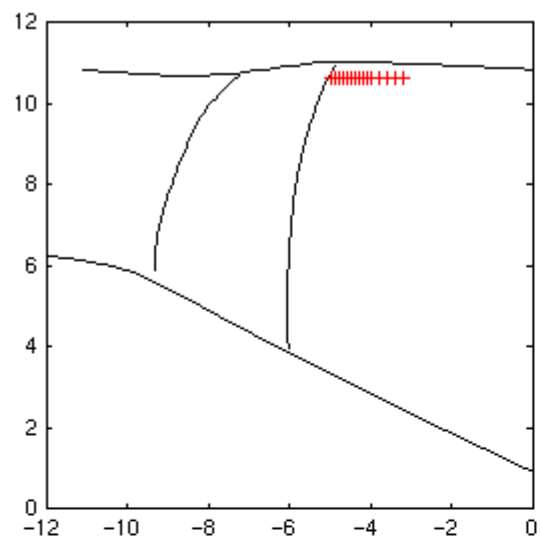


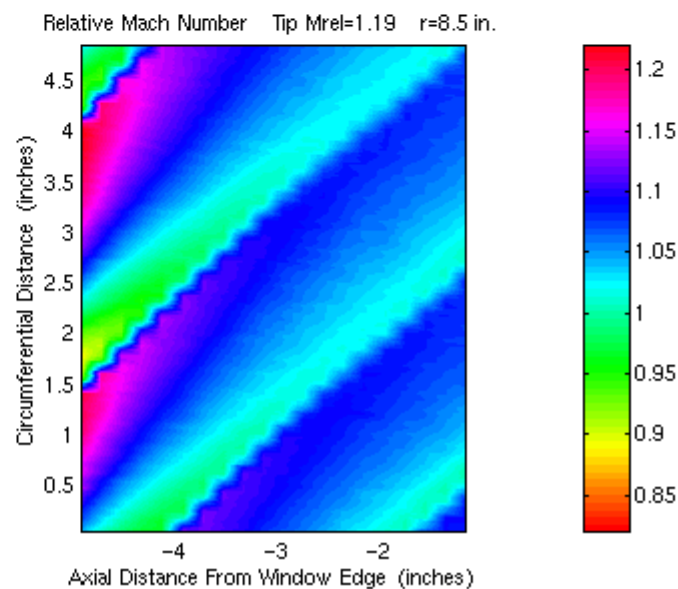
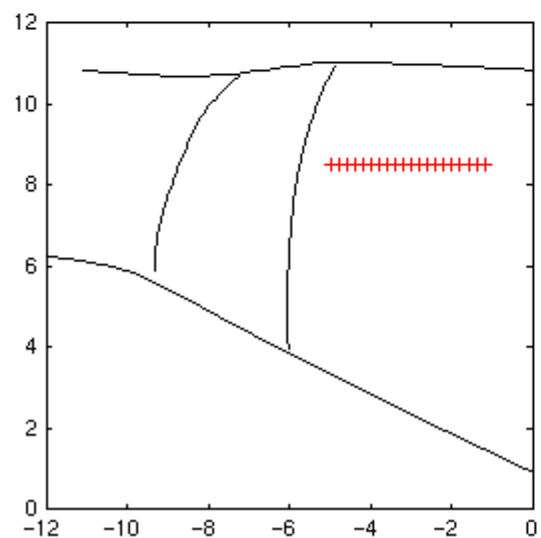
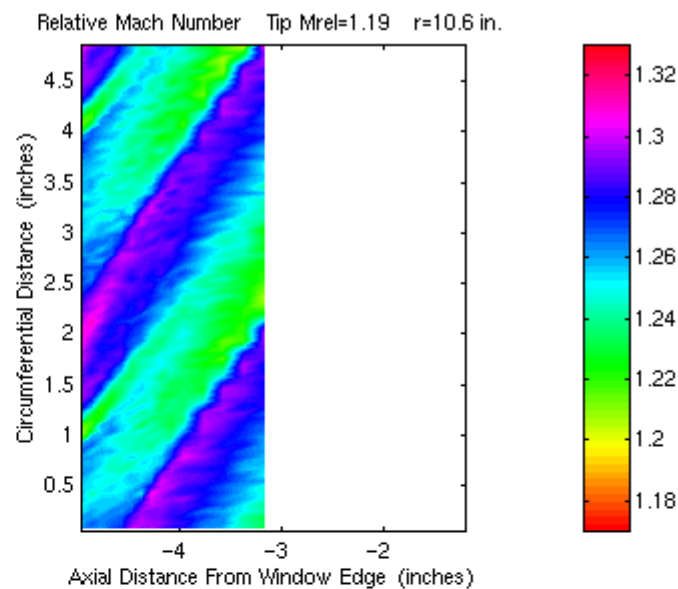
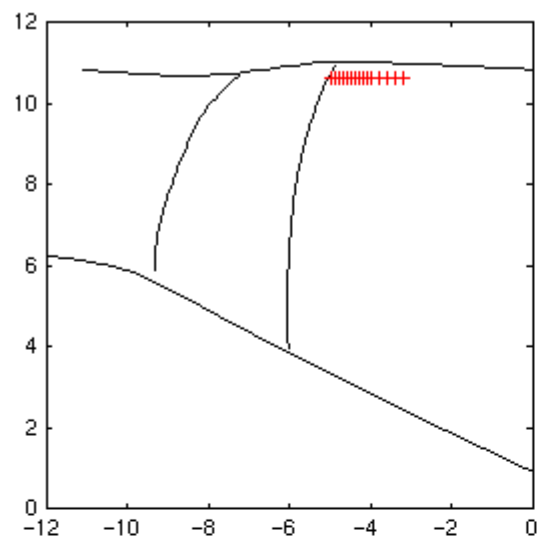


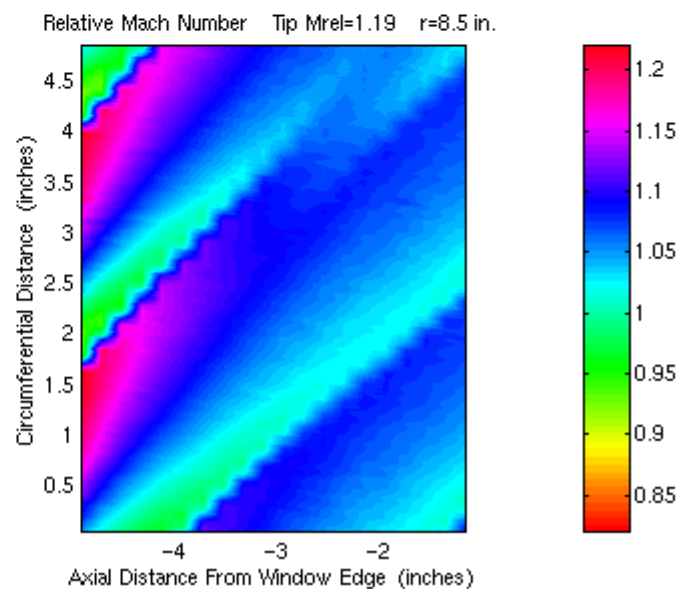
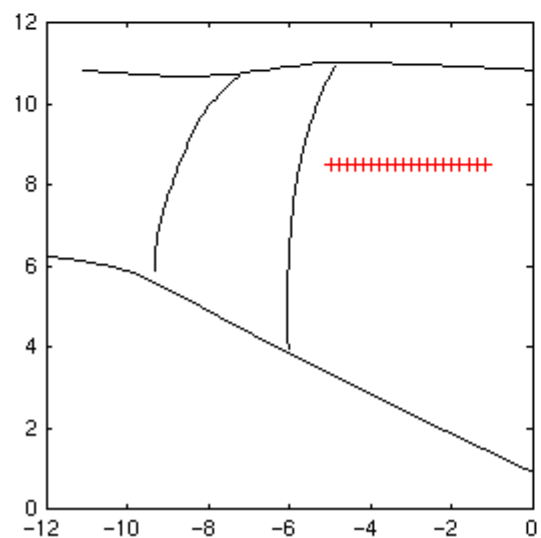
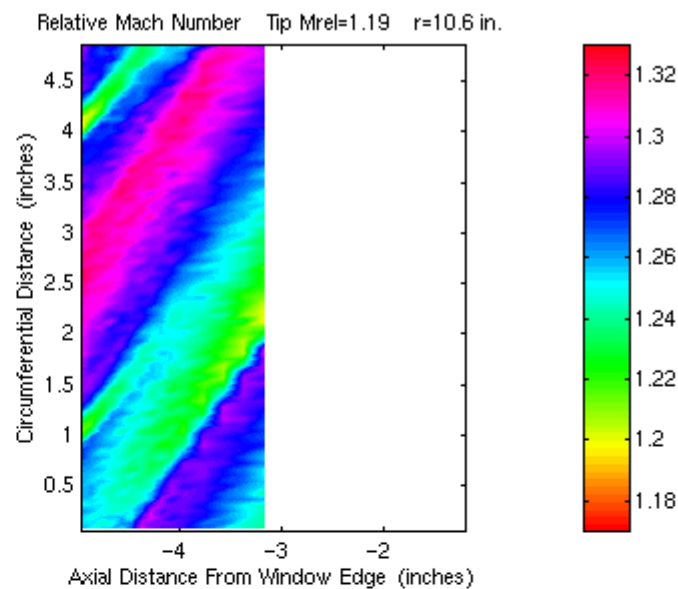
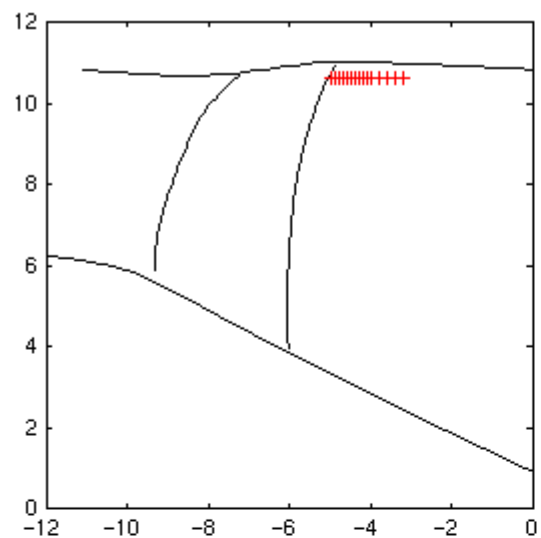


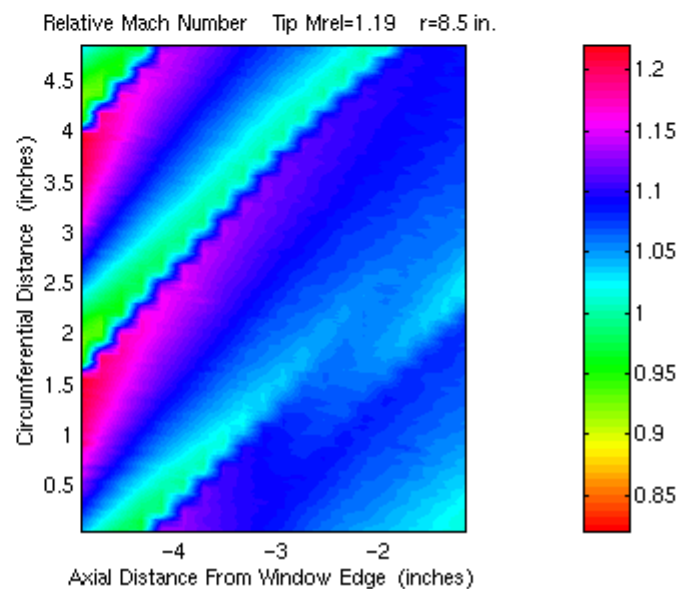
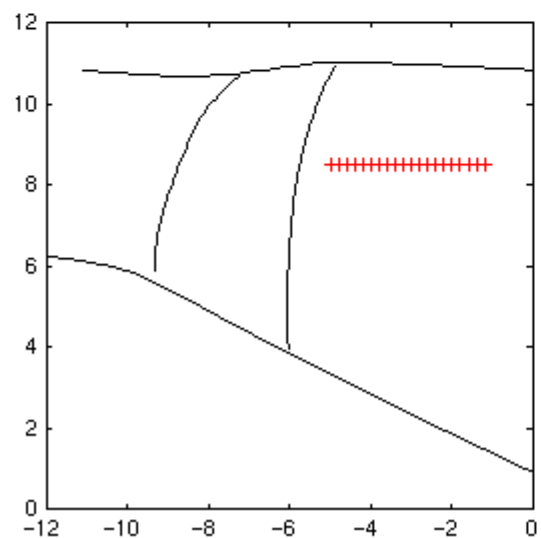
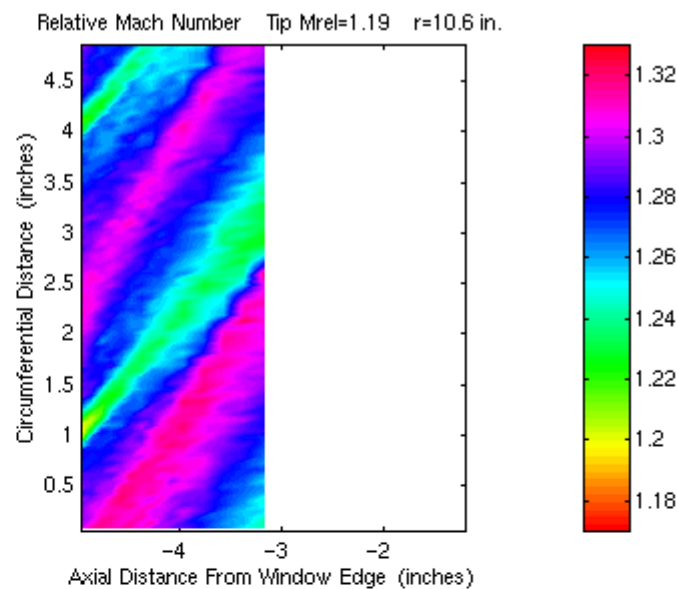
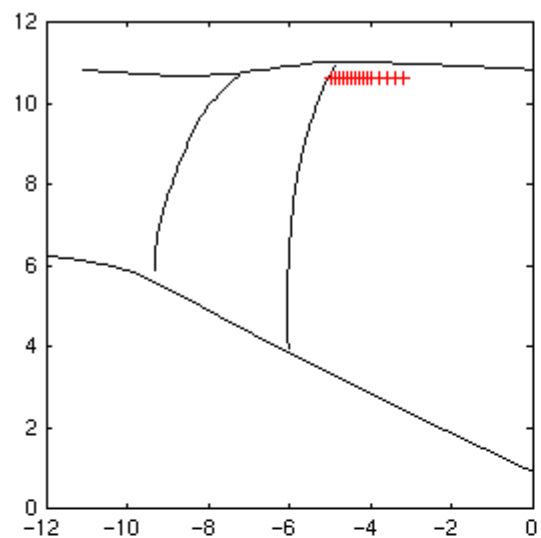


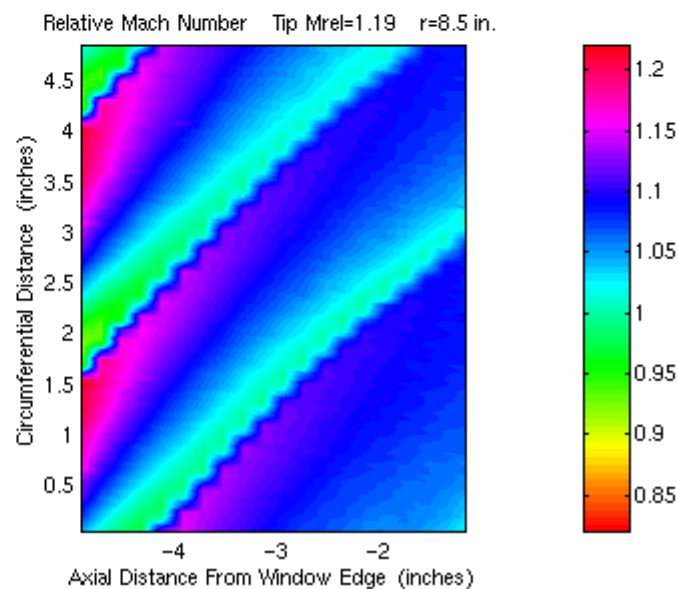
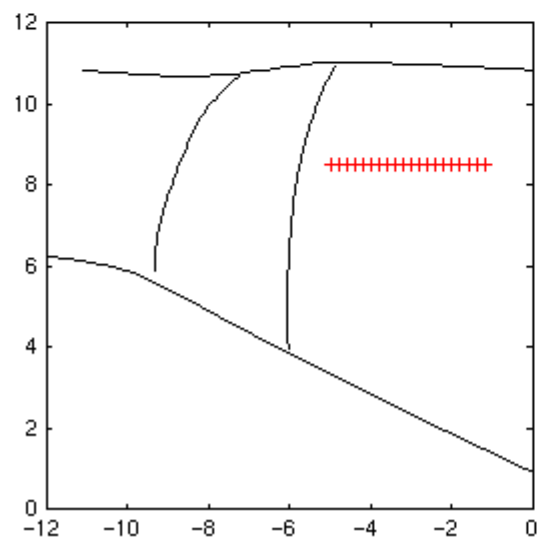
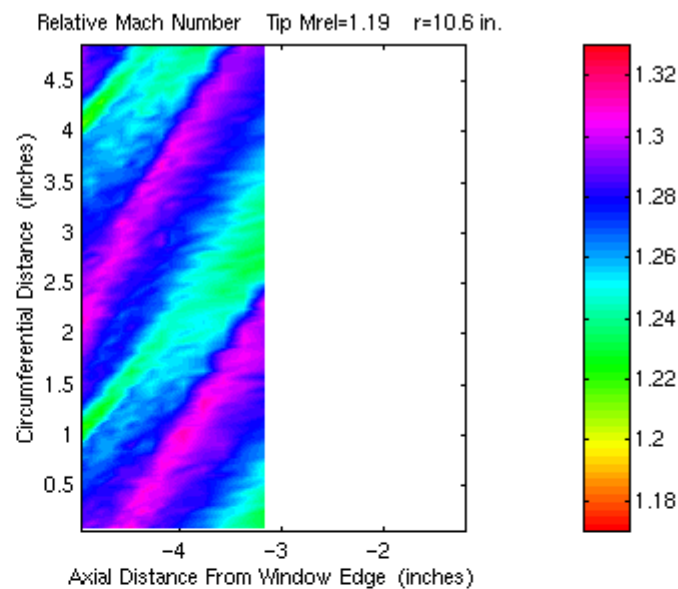
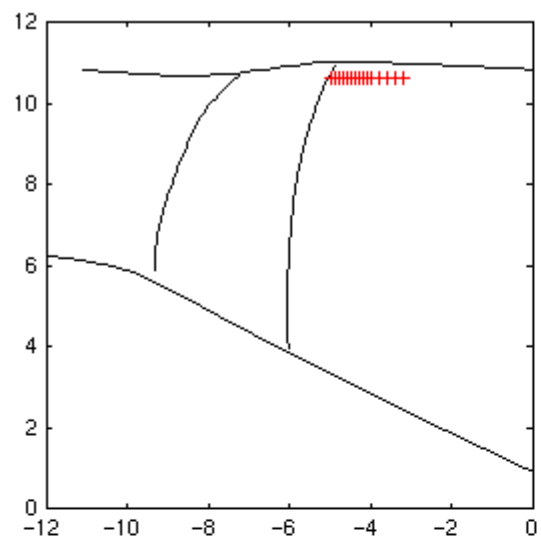


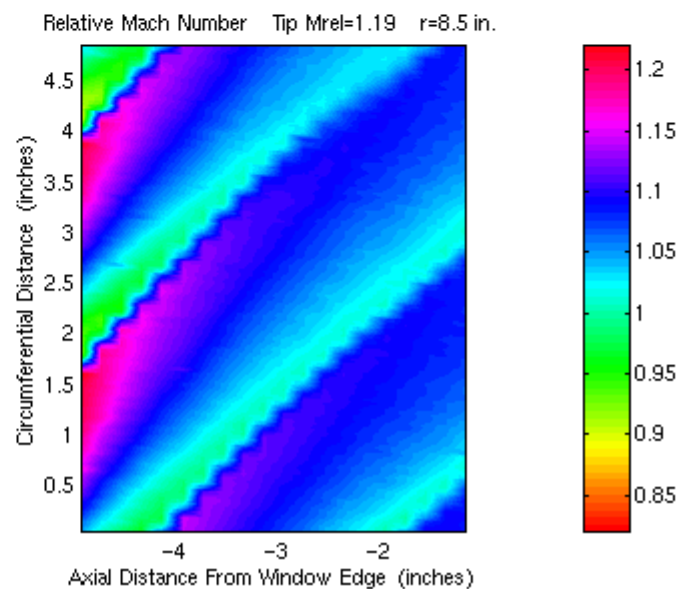
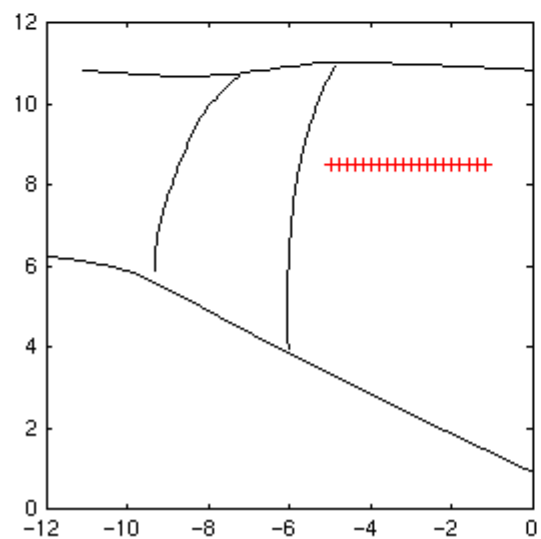
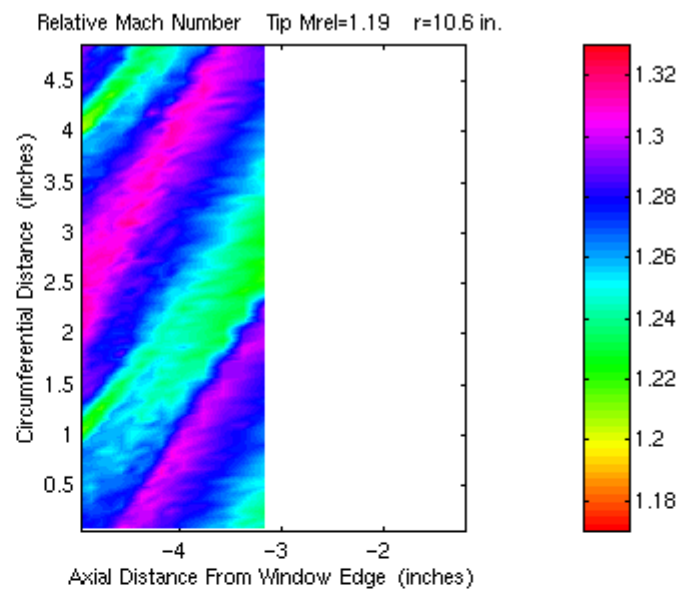
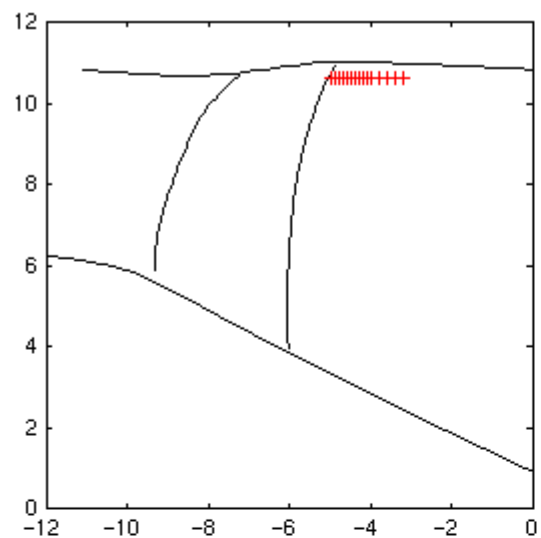


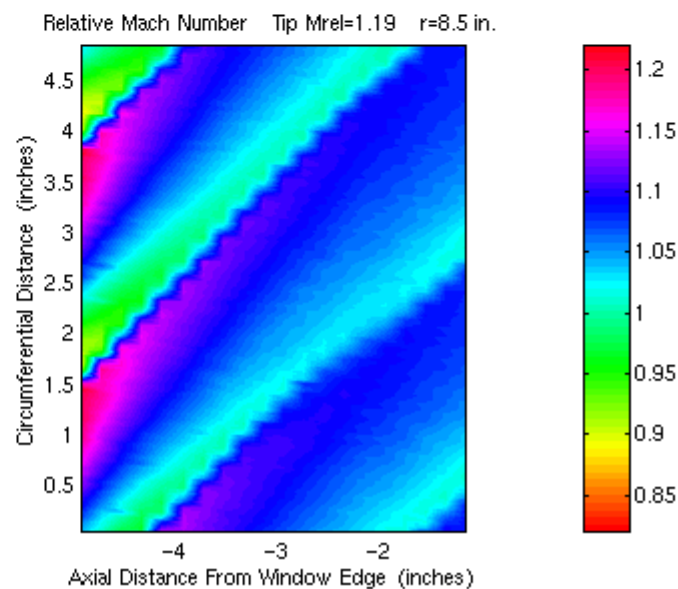
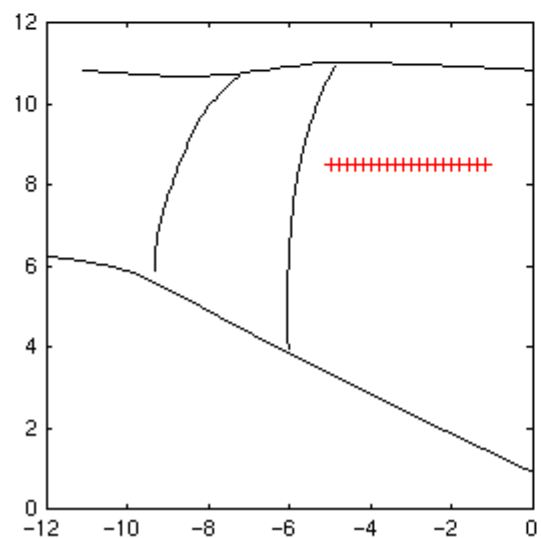
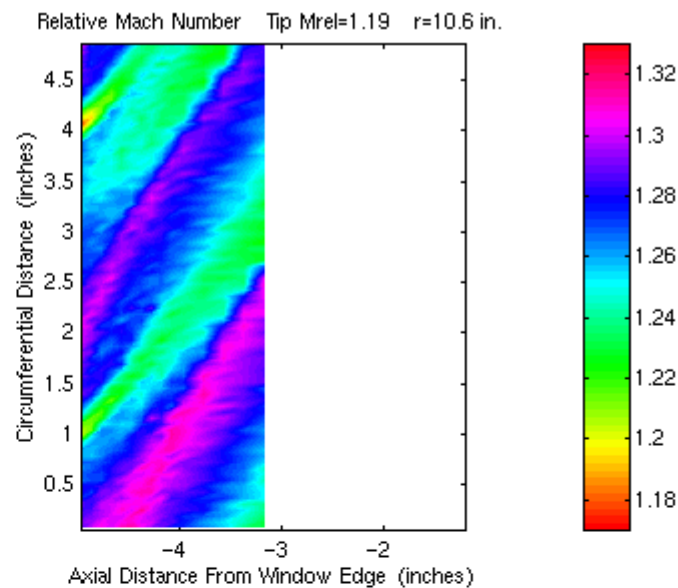
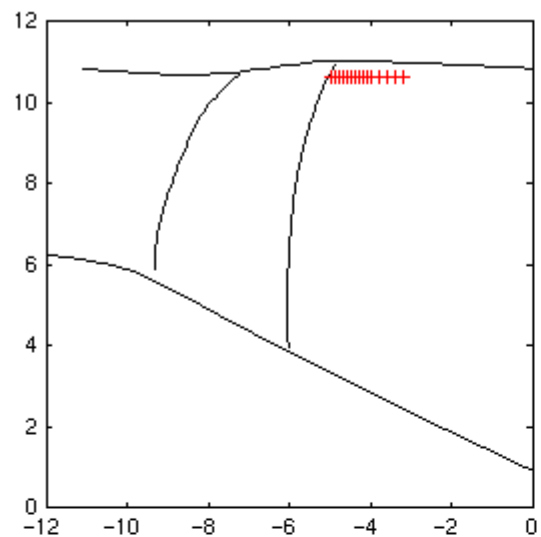












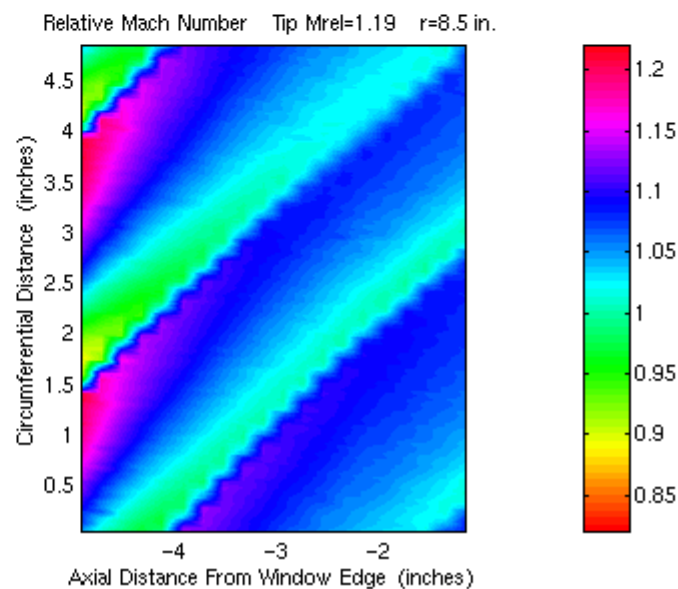
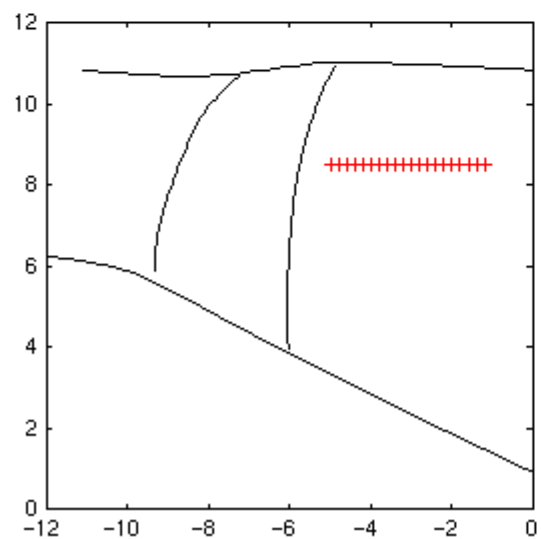
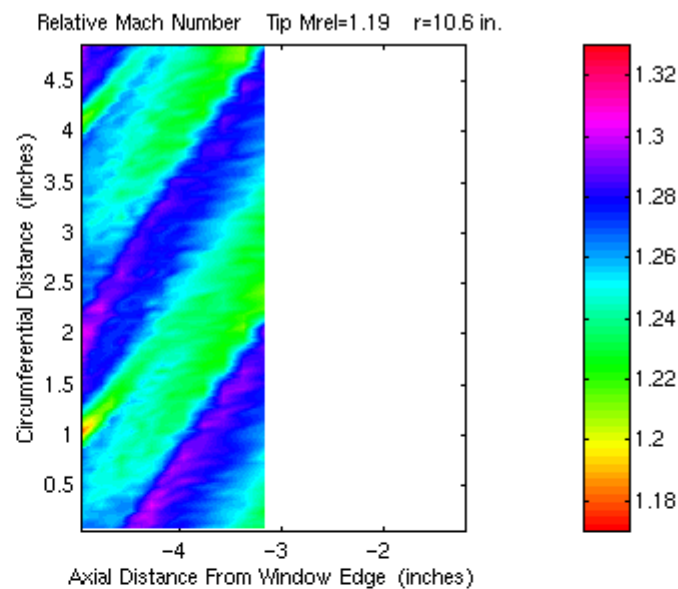
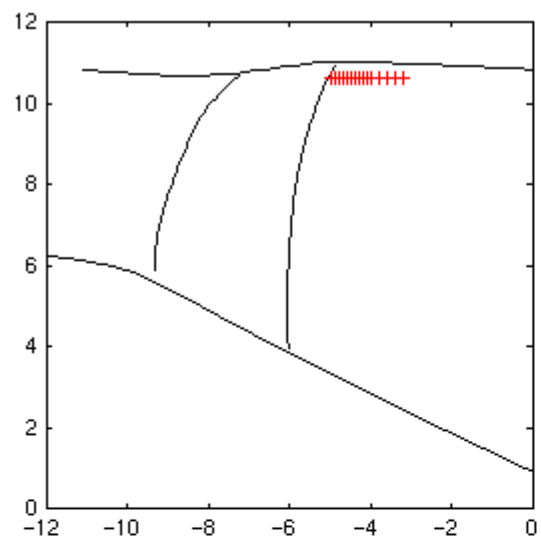
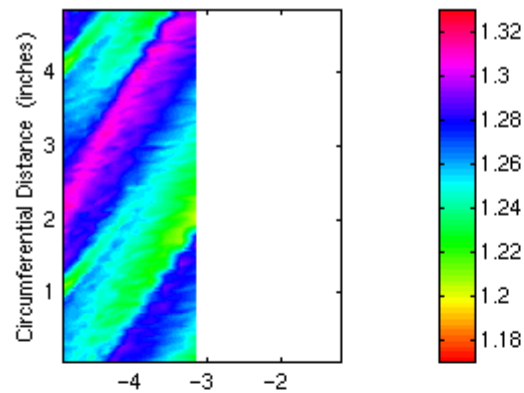
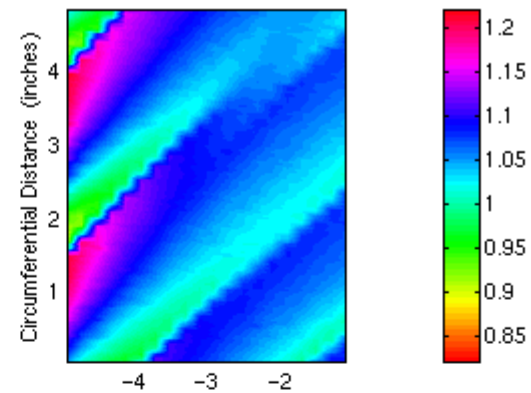


Figure 14.—Slideshow (20 slides) illustrating how the perturbation in the flow measured upstream of the forward-swept fan at $r = 10.6$ in. and $r = 8.5$ in. varies with axial location when the rotor is operated at the high-speed condition. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows autospectra computed from the relative Mach number distributions ($m = 22$ corresponds to the blade passing frequency). The solid lines overlaid on top of the color contour plots show the axial locations at which the data presented on that slide were acquired.

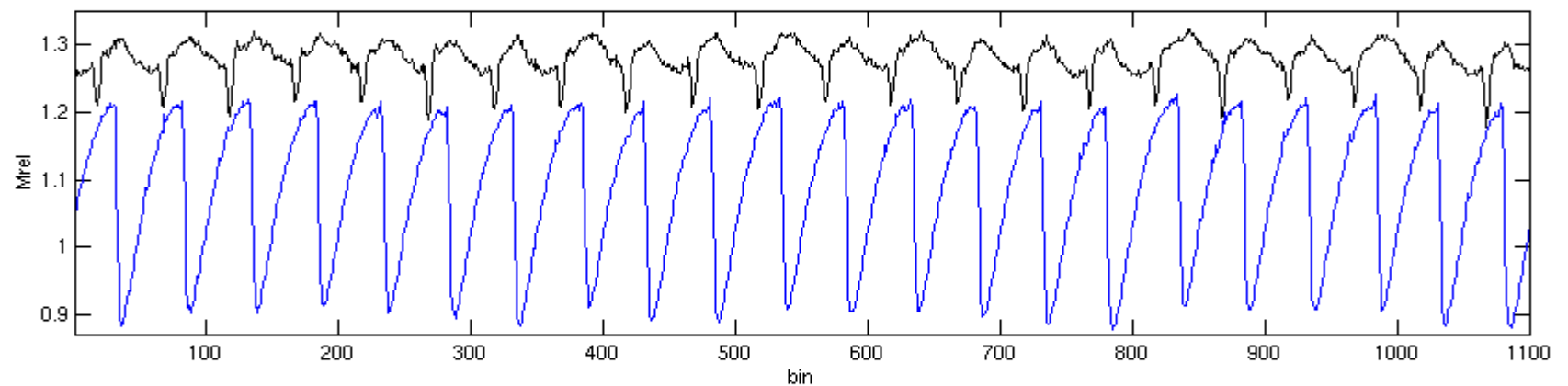
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



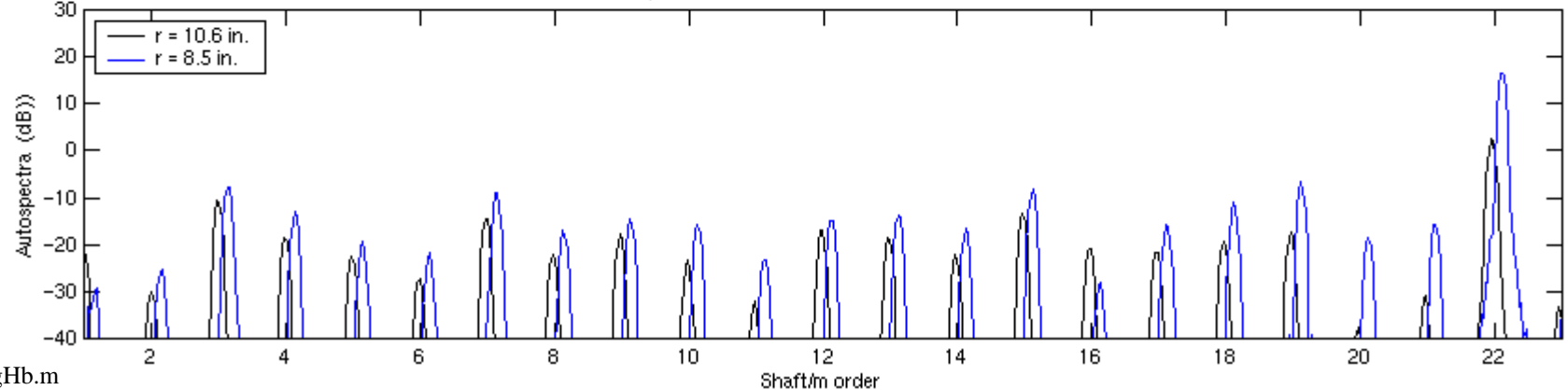
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



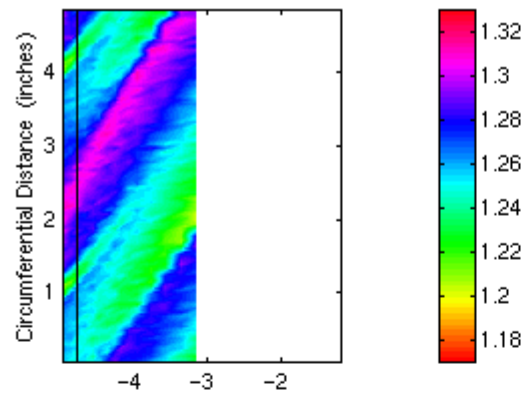
Relative Mach Number Distribution Across Rotor Rev



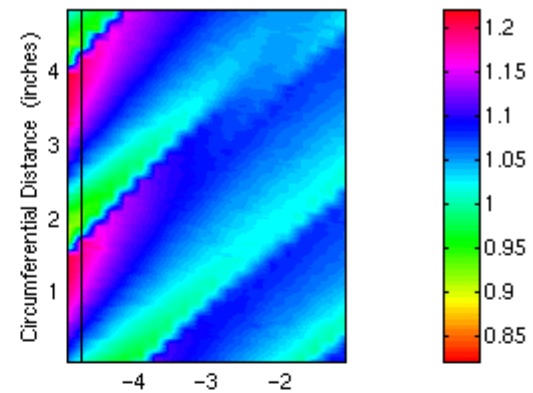
Autospectra of Relative Mach Number Distributions



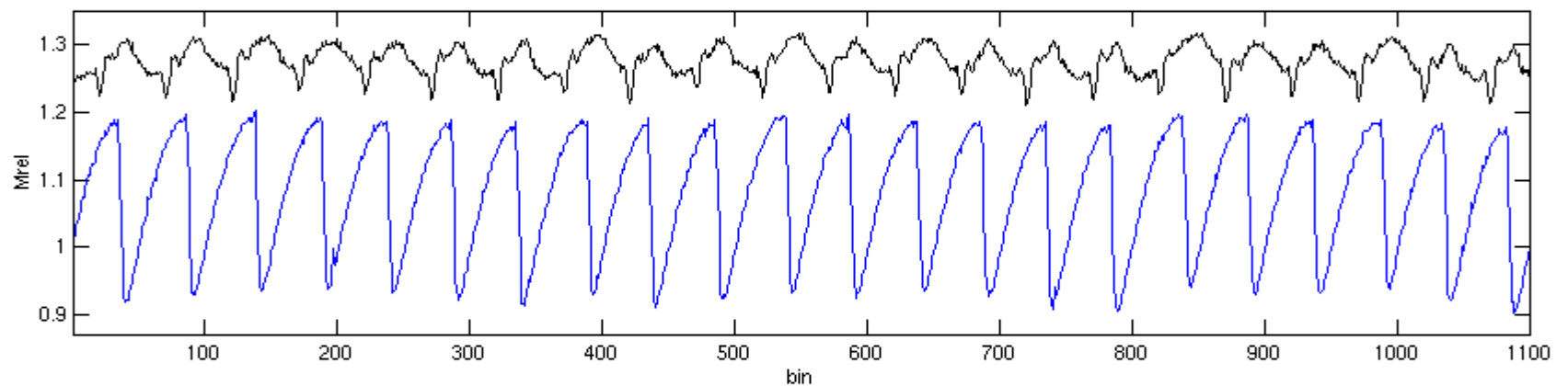
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



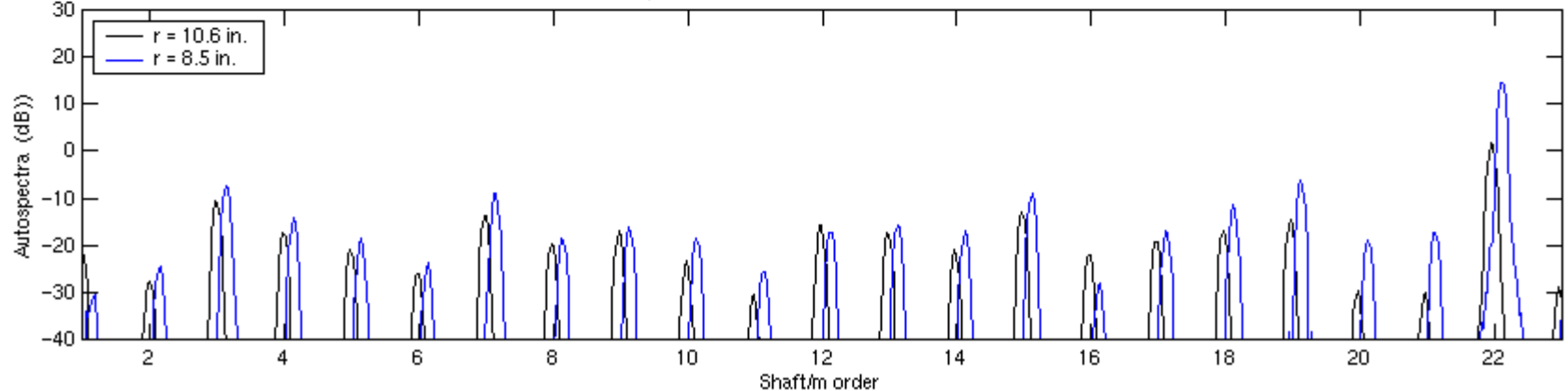
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



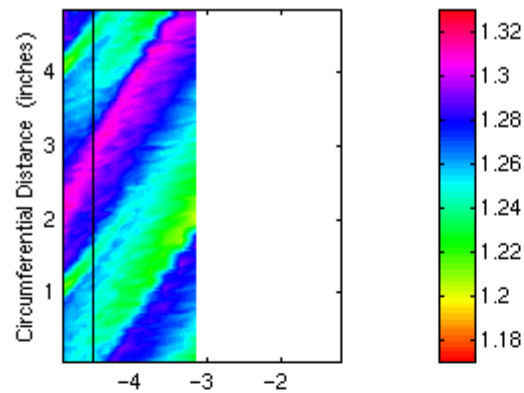
Relative Mach Number Distribution Across Rotor Rev



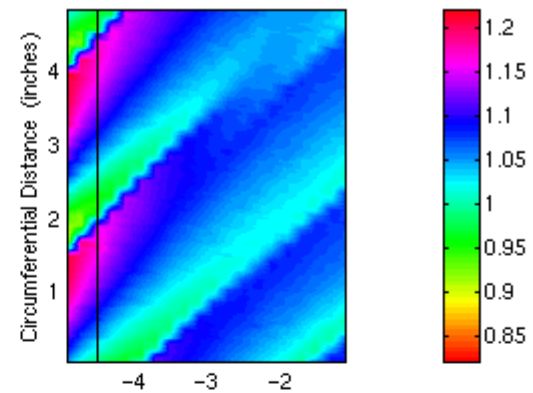
Autospectra of Relative Mach Number Distributions



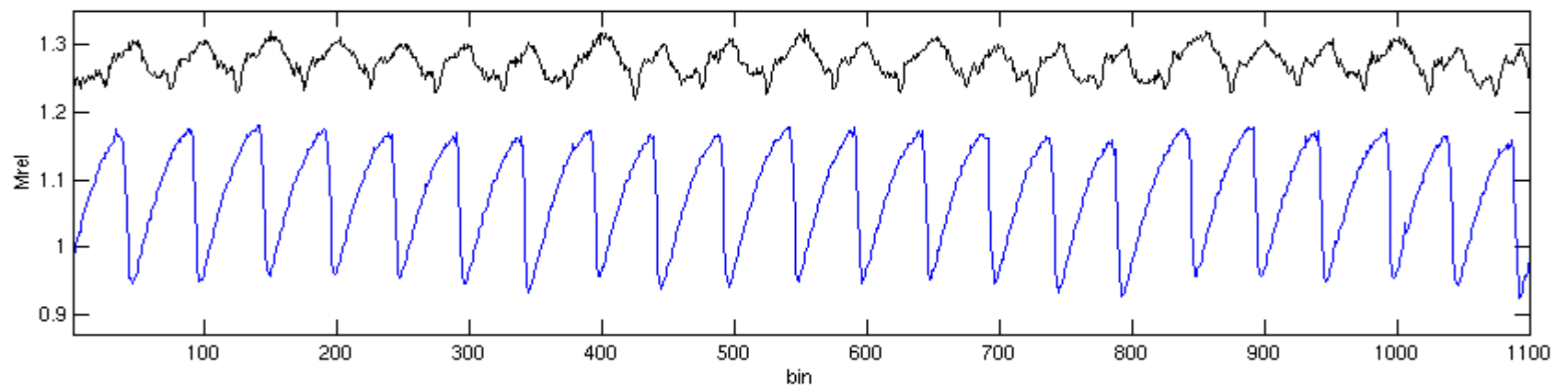
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



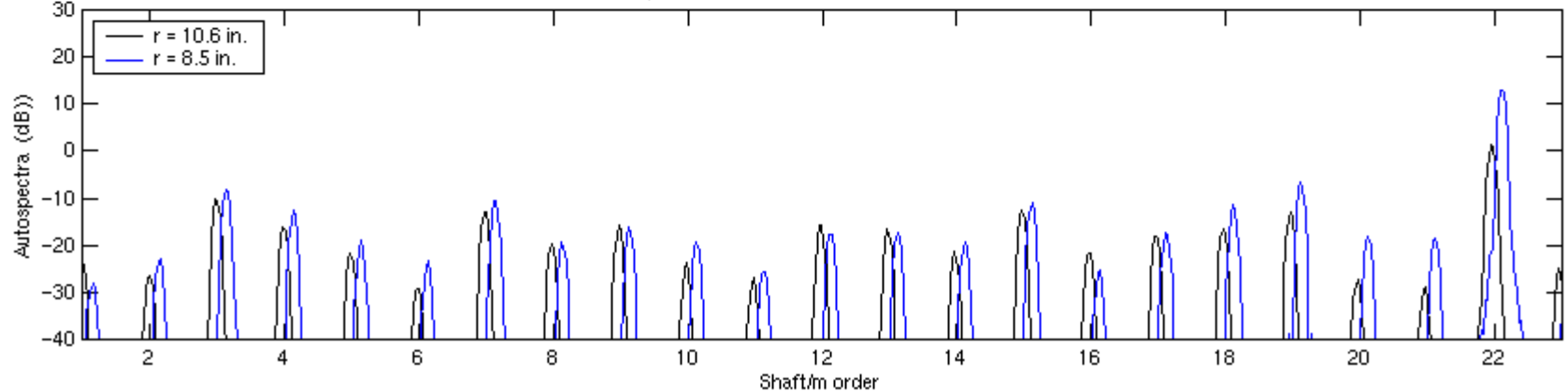
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



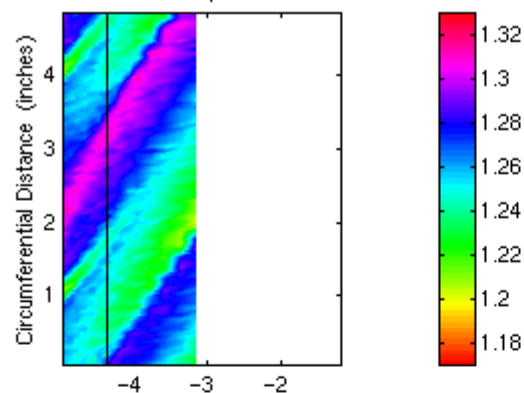
Relative Mach Number Distribution Across Rotor Rev



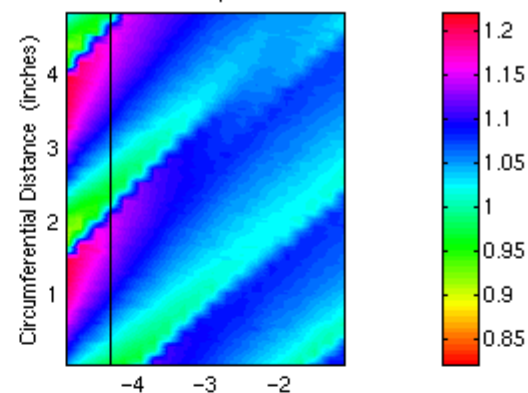
Autospectra of Relative Mach Number Distributions



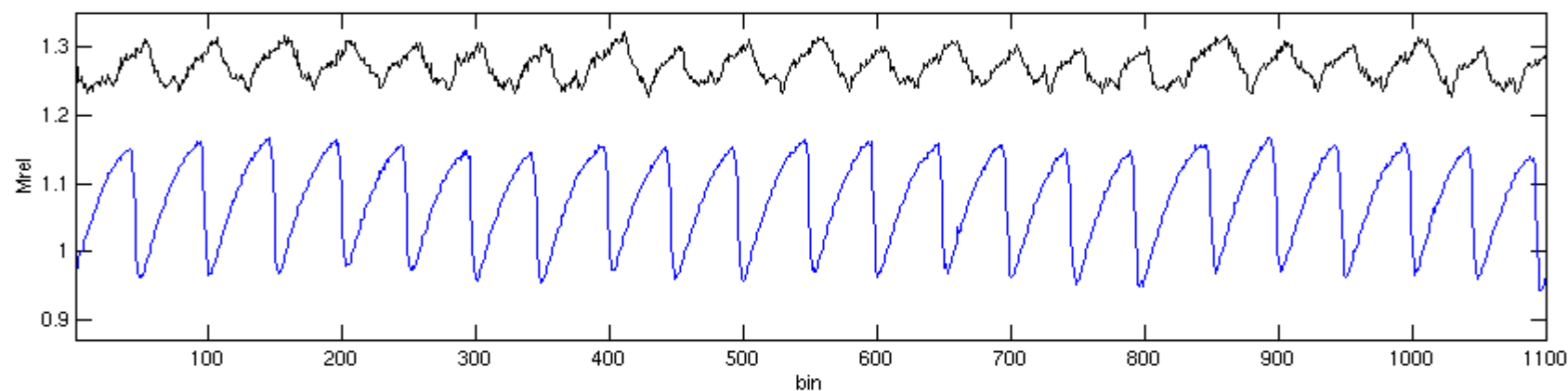
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



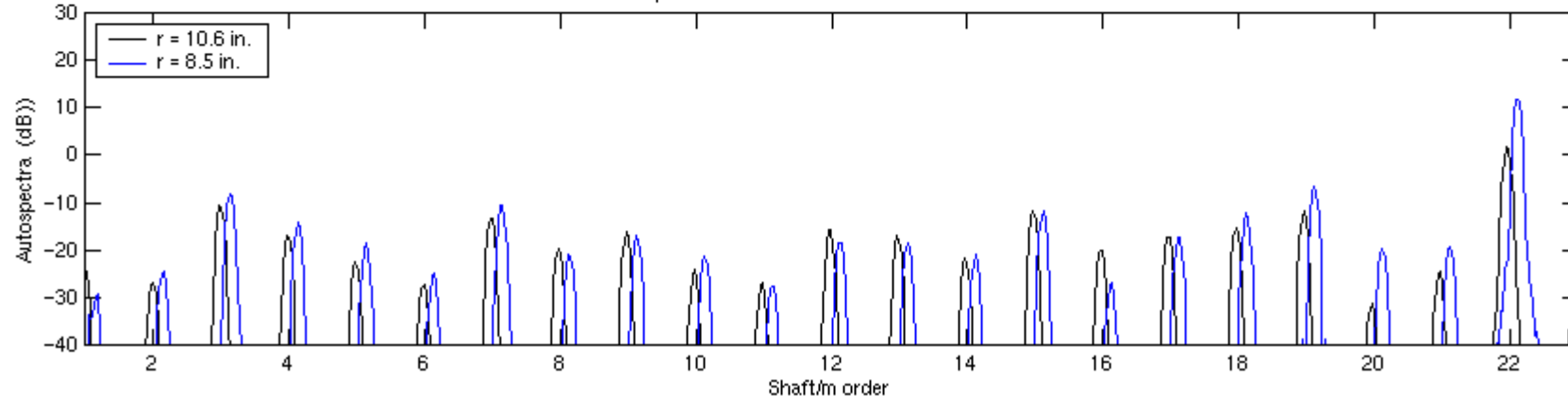
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



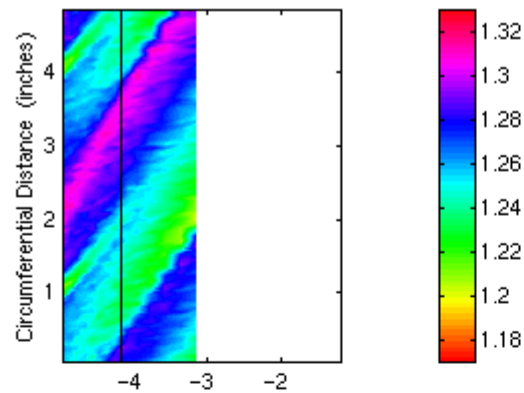
Relative Mach Number Distribution Across Rotor Rev



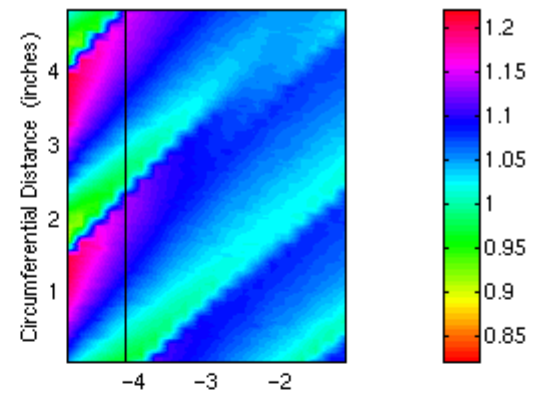
Autospectra of Relative Mach Number Distributions



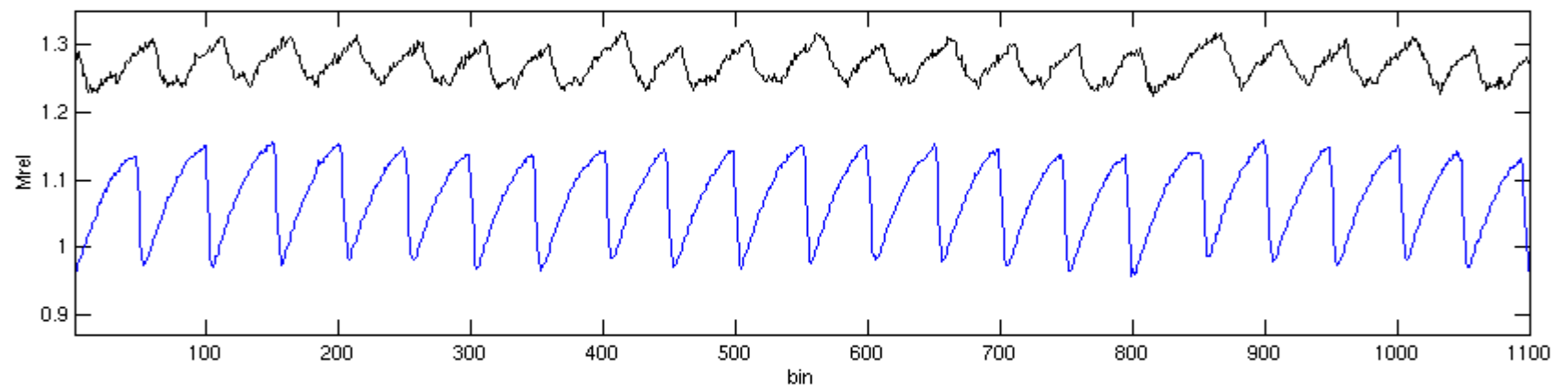
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



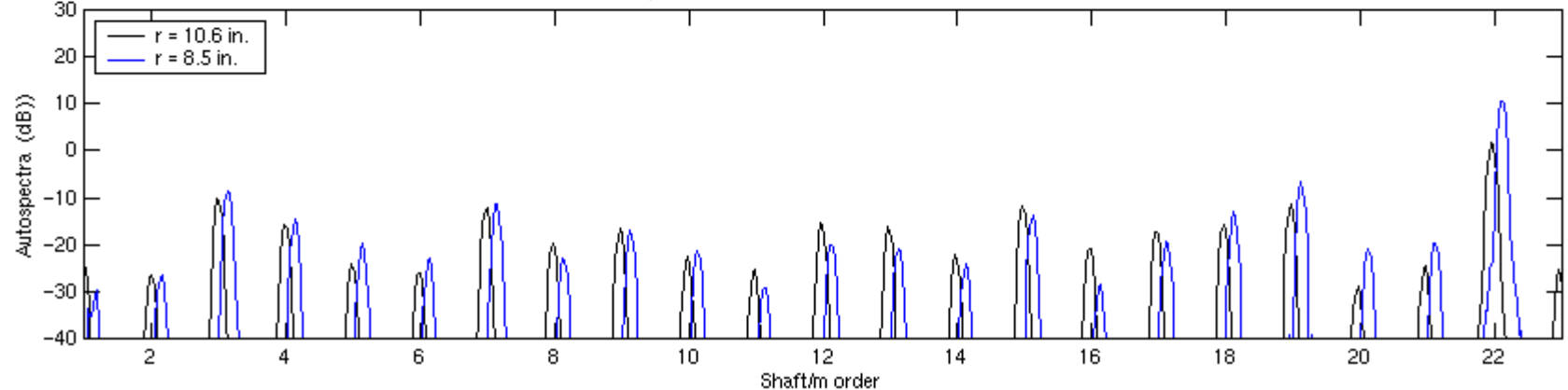
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



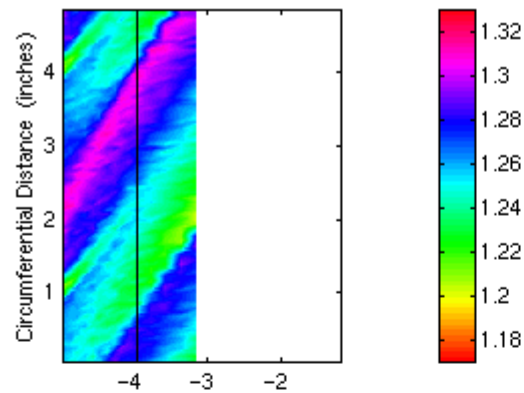
Relative Mach Number Distribution Across Rotor Rev



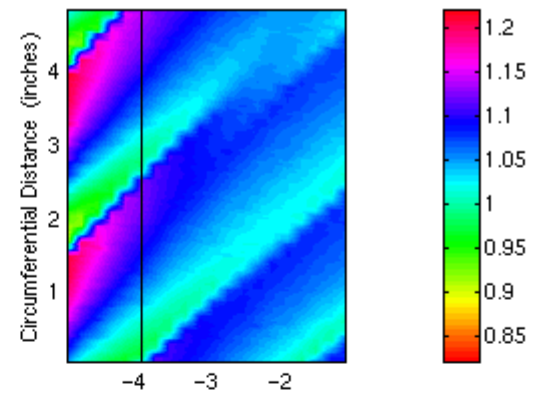
Autospectra of Relative Mach Number Distributions



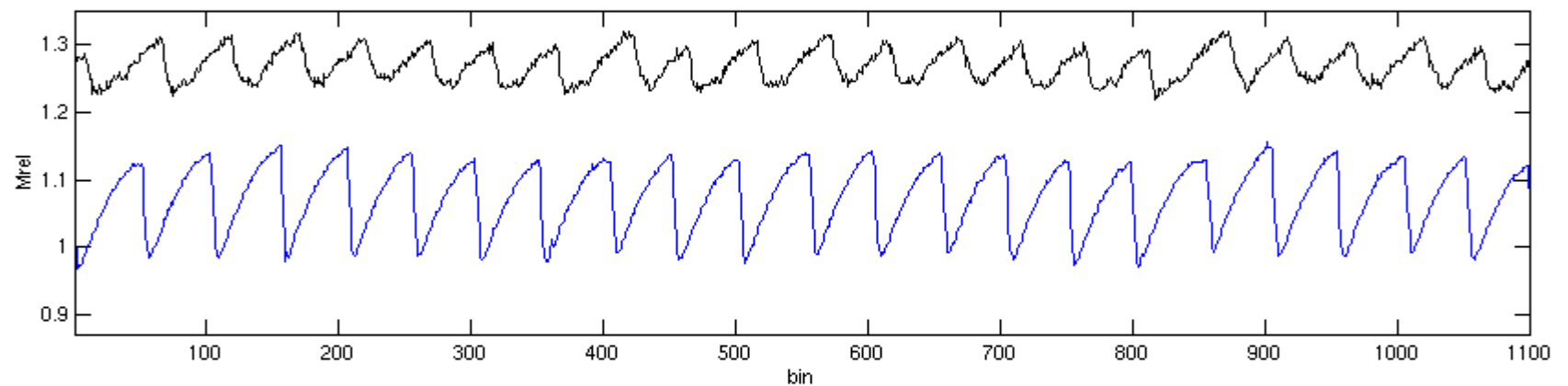
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



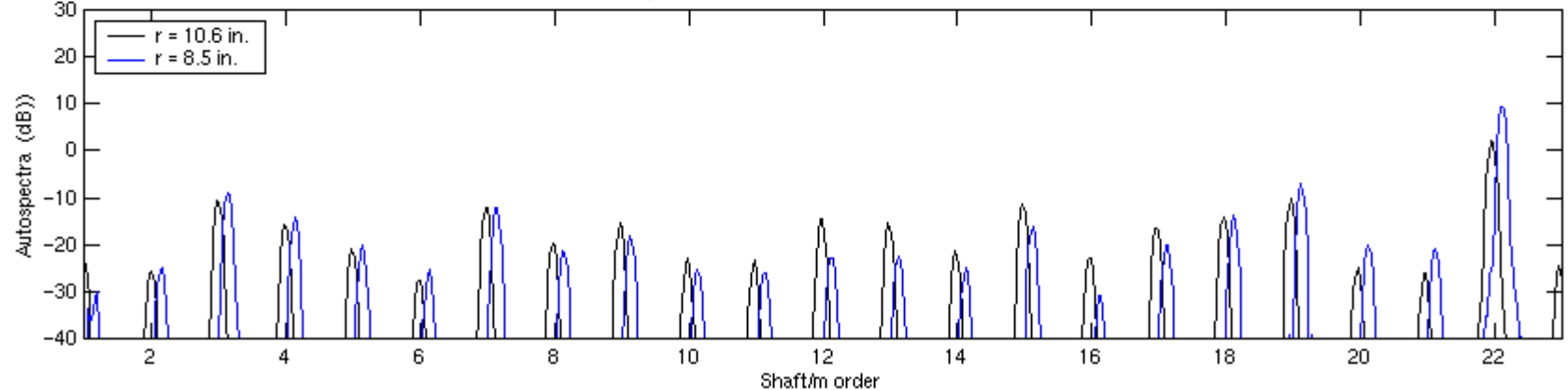
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



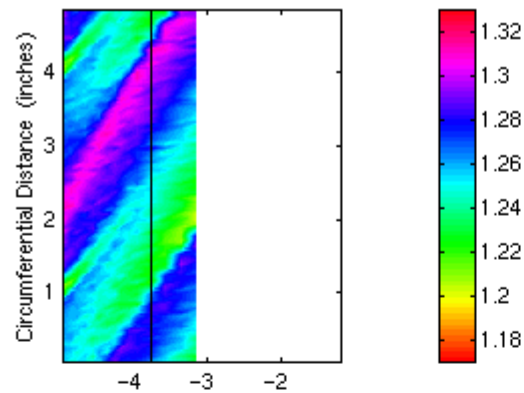
Relative Mach Number Distribution Across Rotor Rev



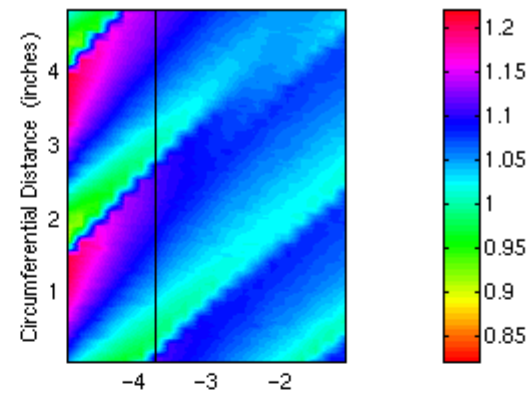
Autospectra of Relative Mach Number Distributions



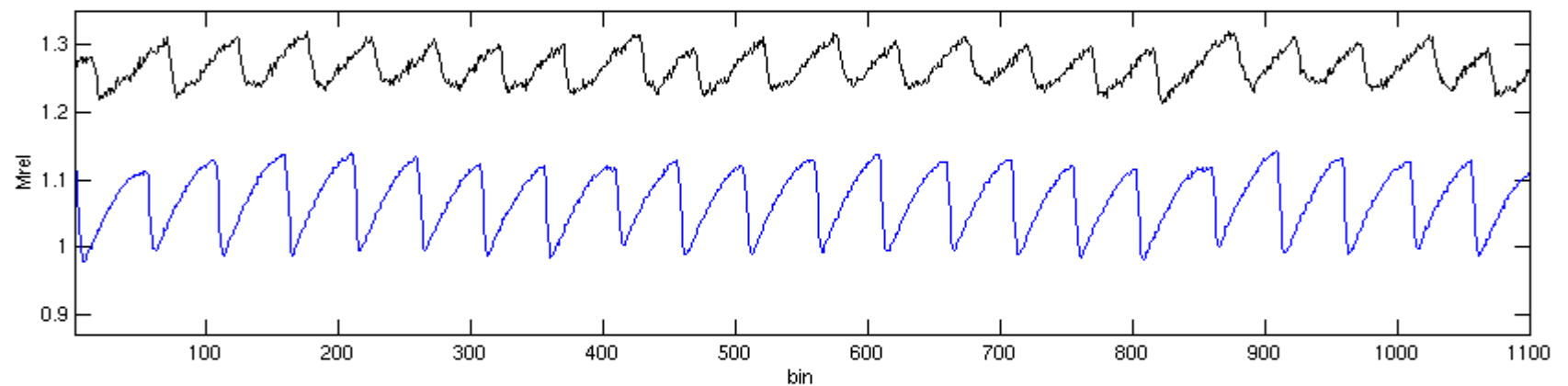
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



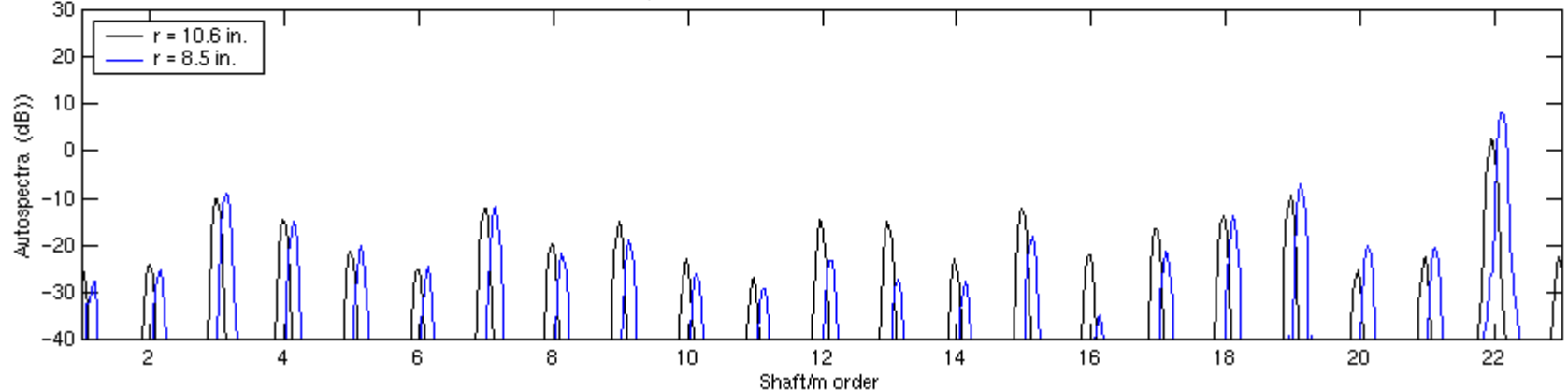
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



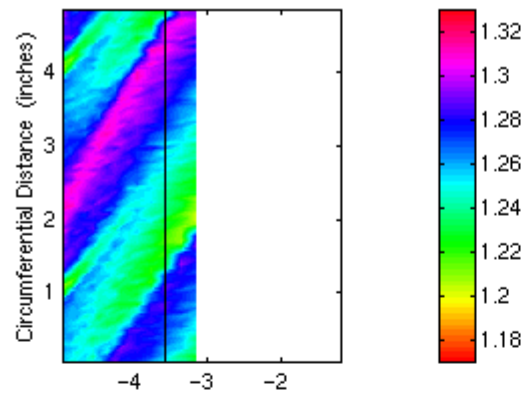
Relative Mach Number Distribution Across Rotor Rev



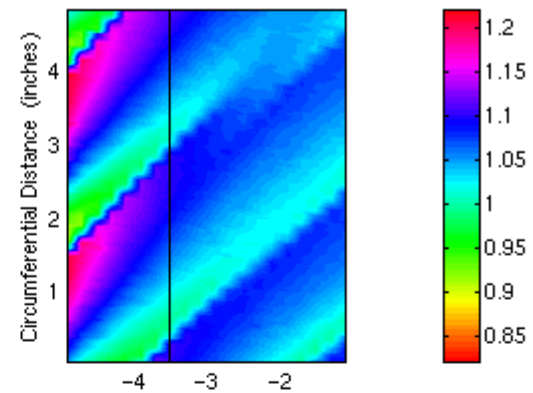
Autospectra of Relative Mach Number Distributions



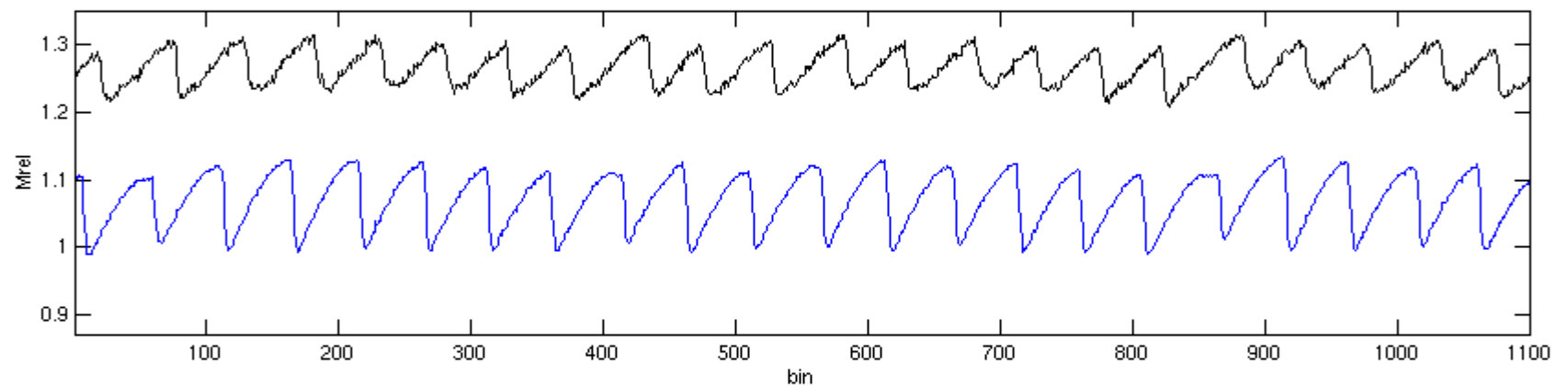
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



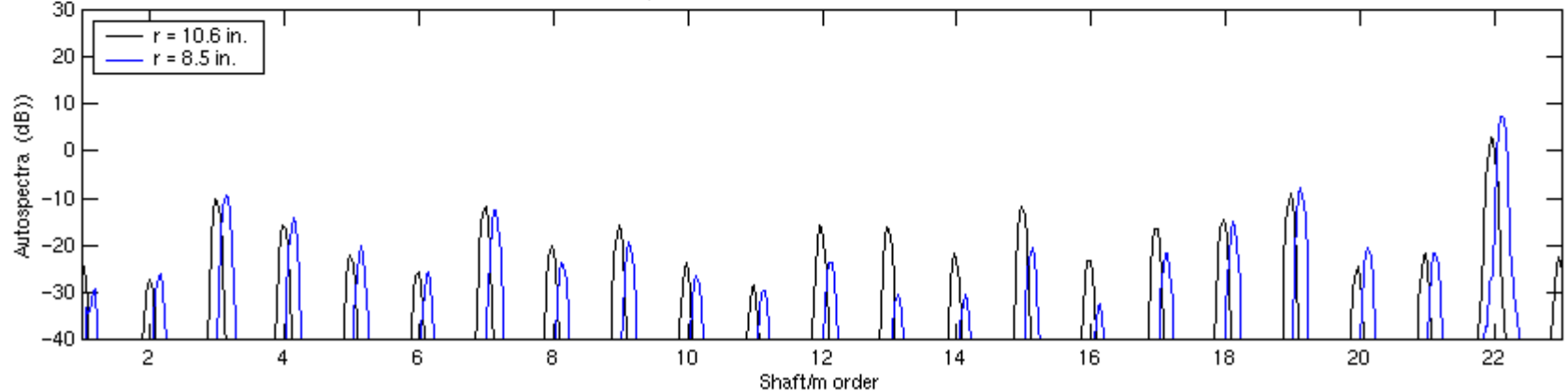
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



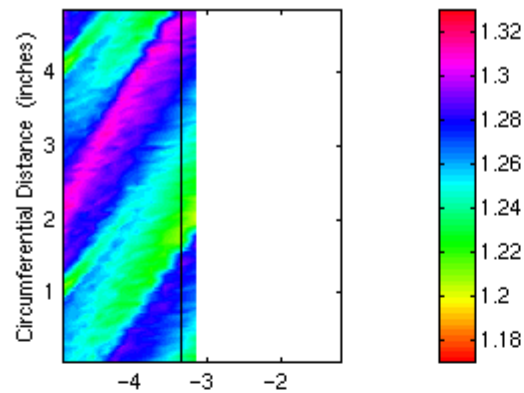
Relative Mach Number Distribution Across Rotor Rev



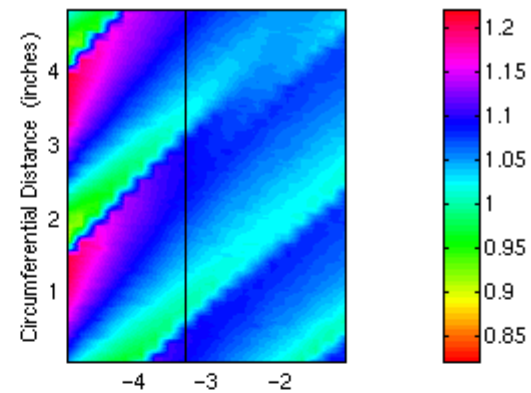
Autospectra of Relative Mach Number Distributions



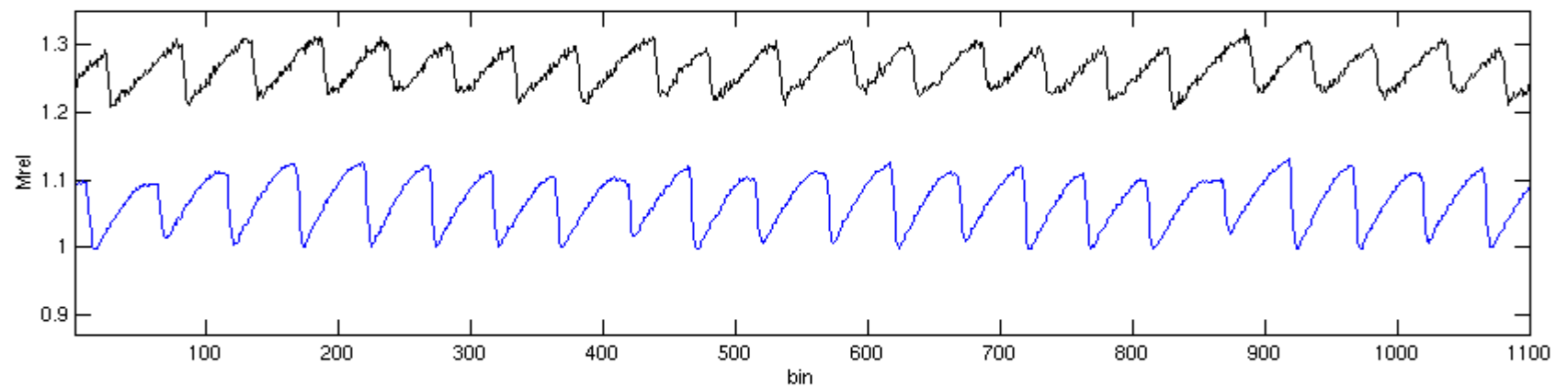
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



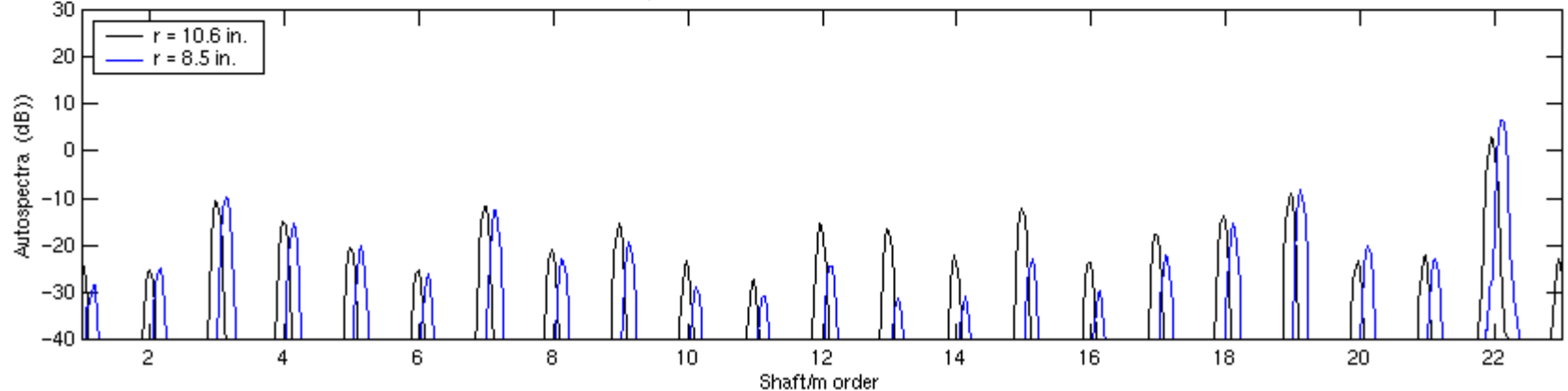
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



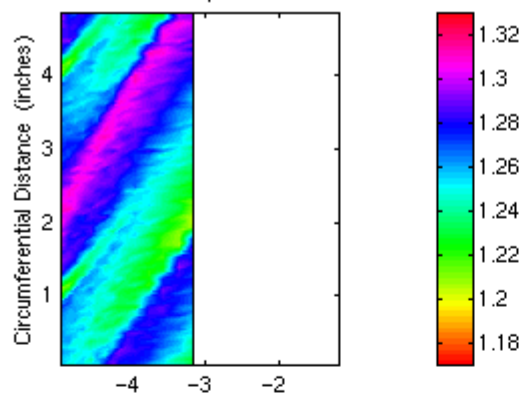
Relative Mach Number Distribution Across Rotor Rev



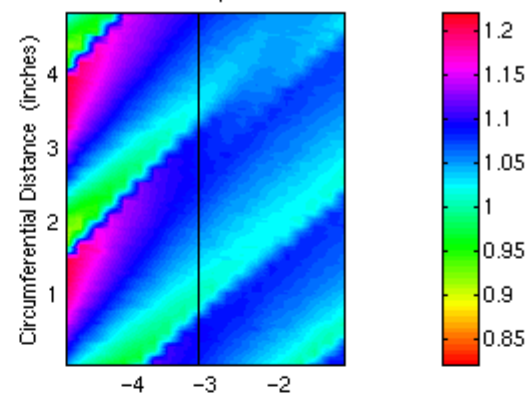
Autospectra of Relative Mach Number Distributions



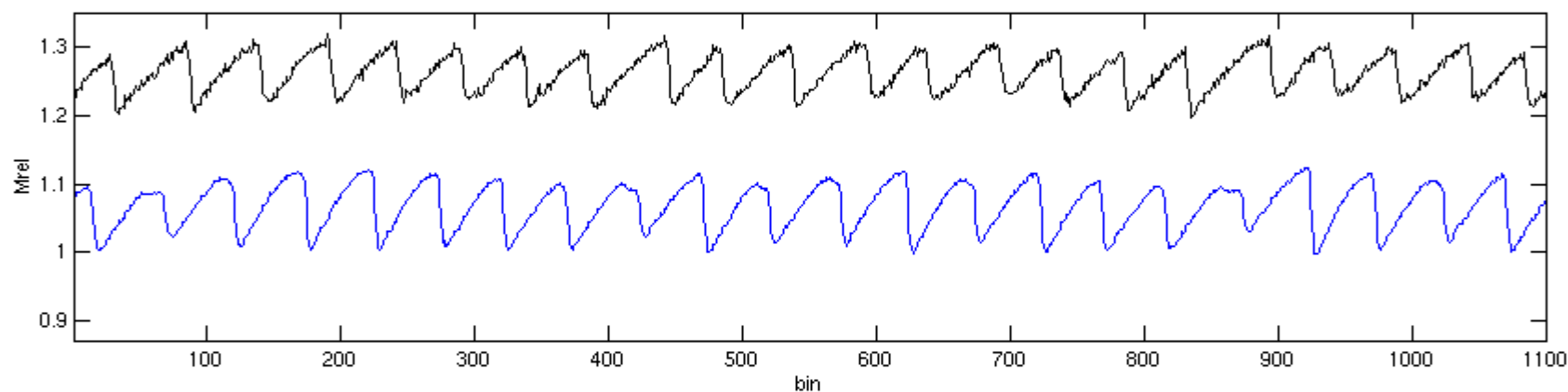
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



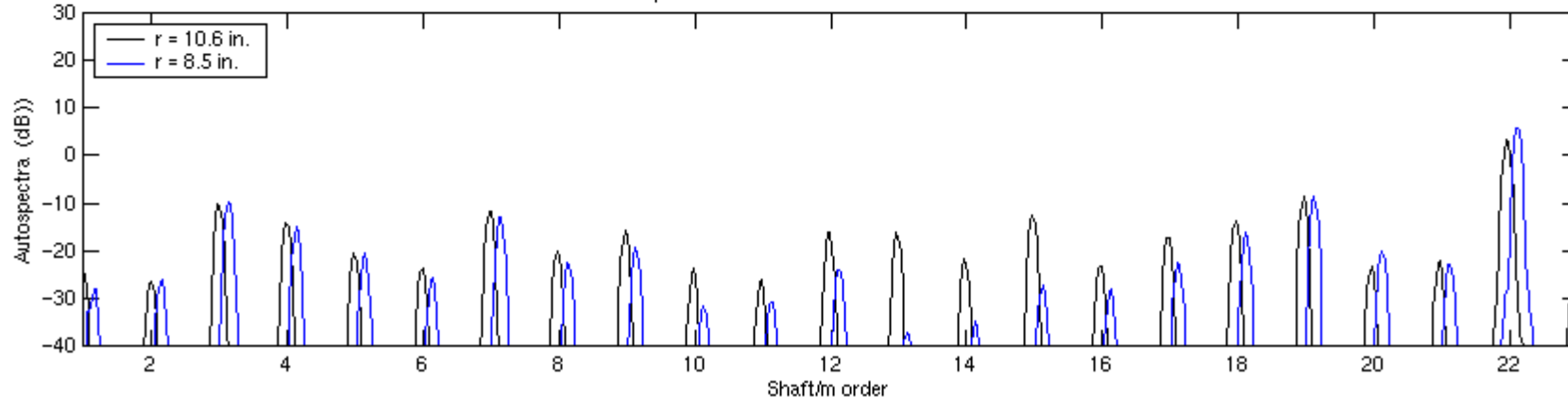
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



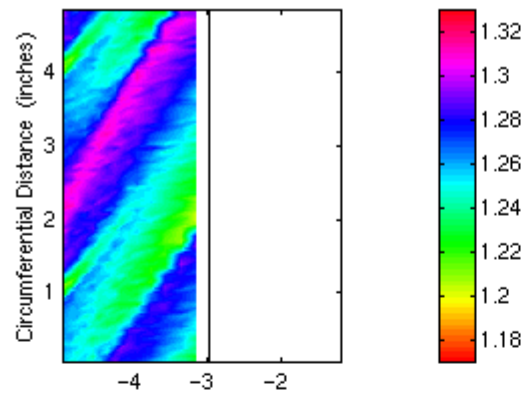
Relative Mach Number Distribution Across Rotor Rev



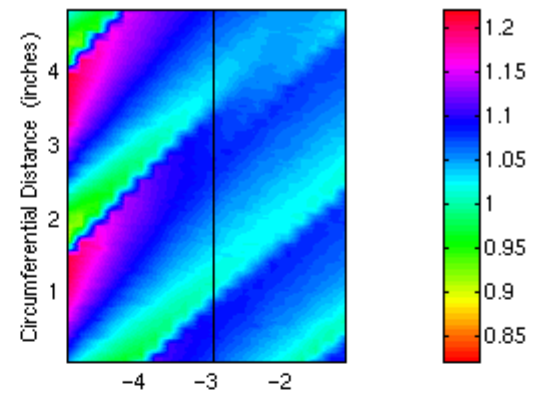
Autospectra of Relative Mach Number Distributions



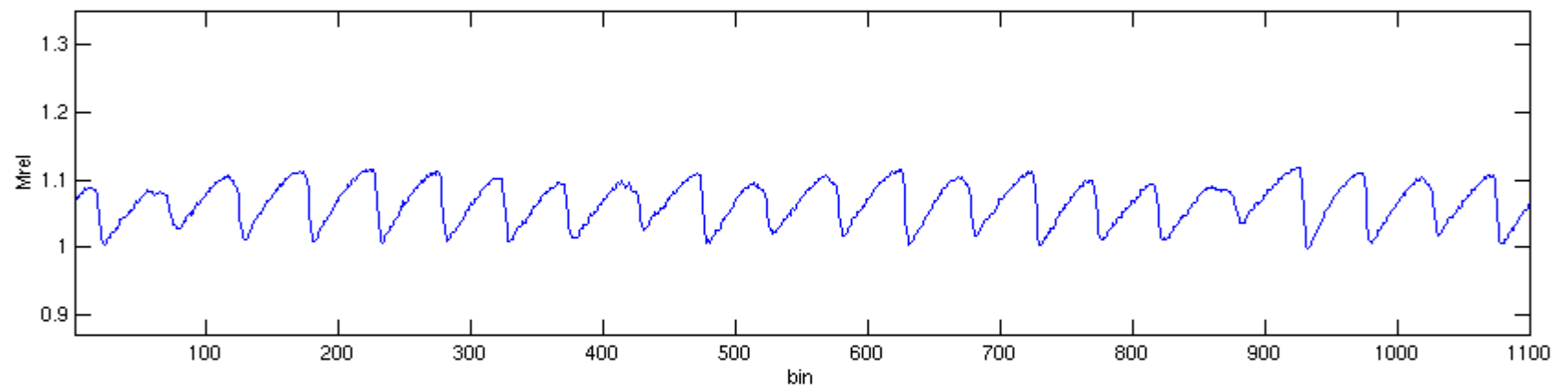
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



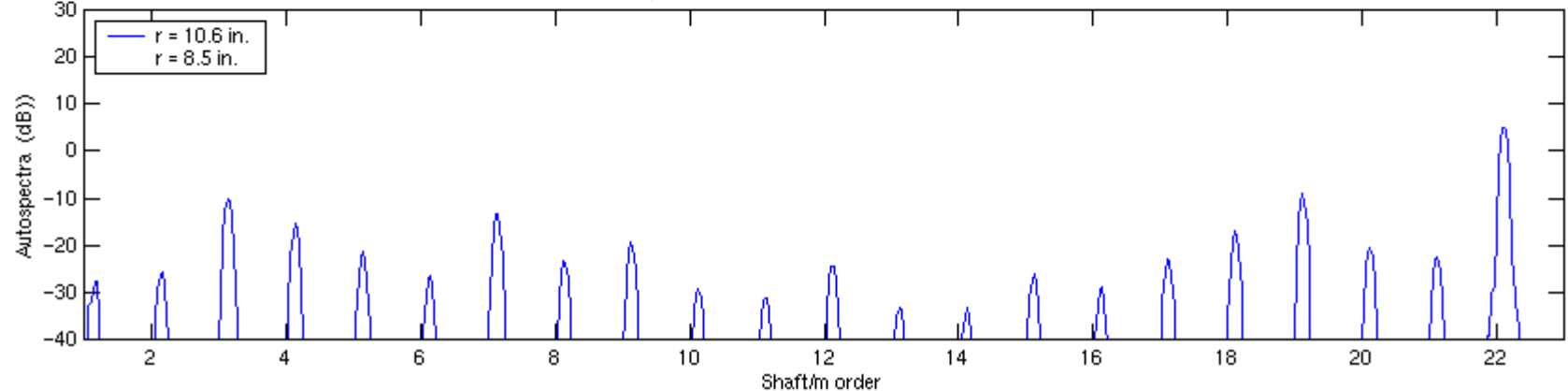
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



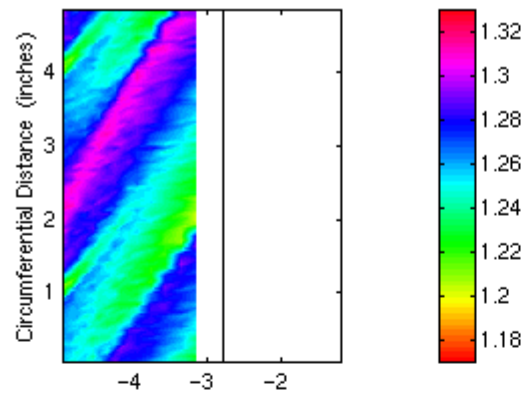
Relative Mach Number Distribution Across Rotor Rev



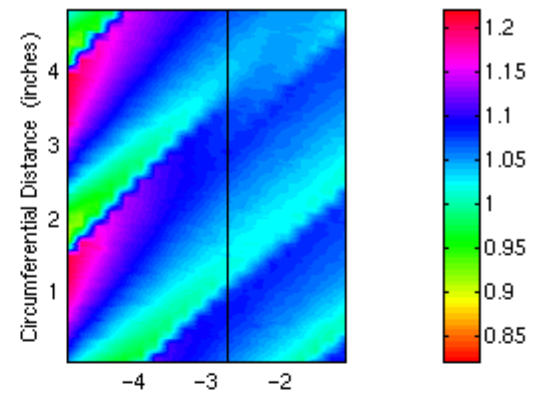
Autospectra of Relative Mach Number Distributions



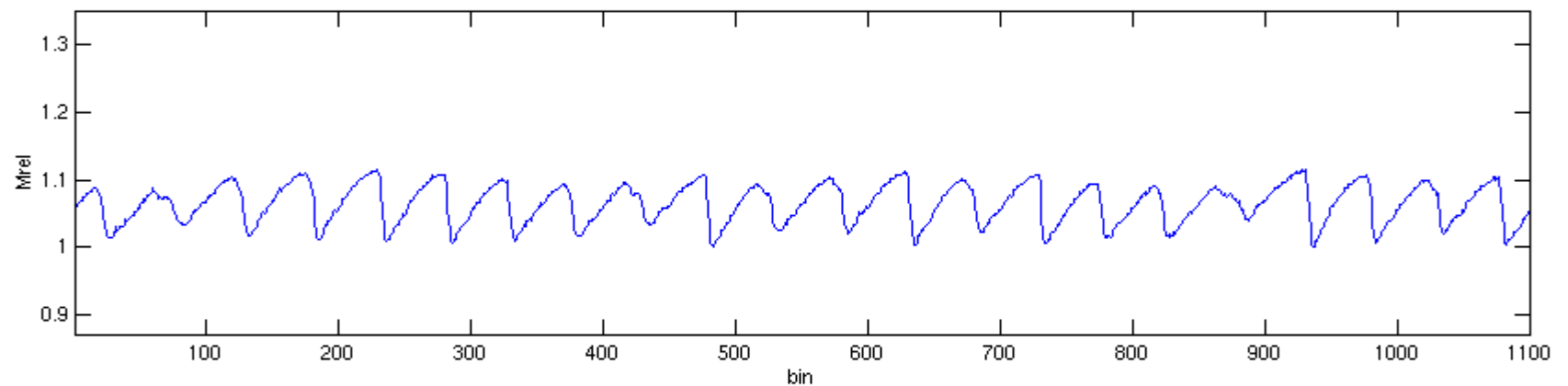
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



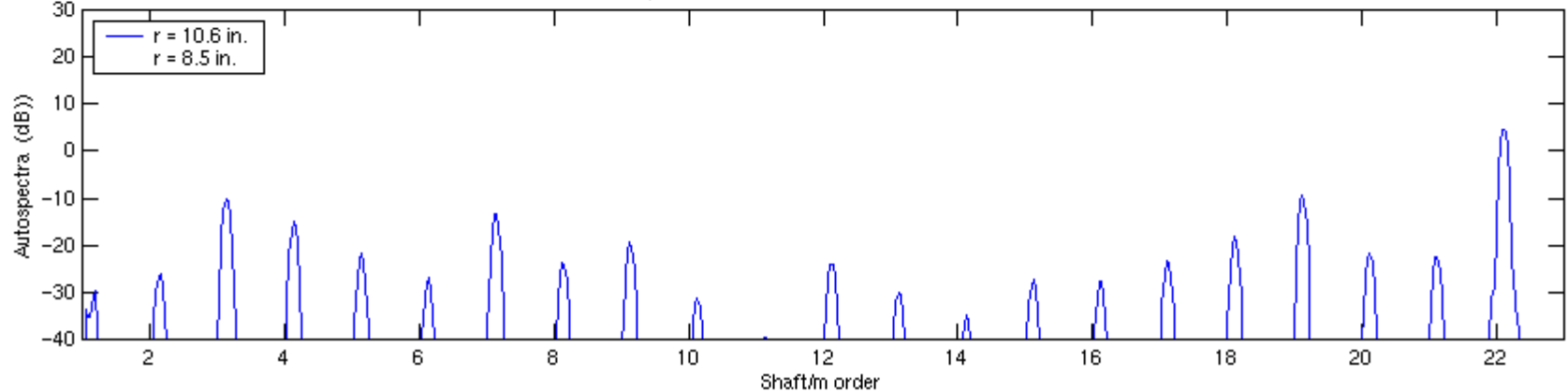
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



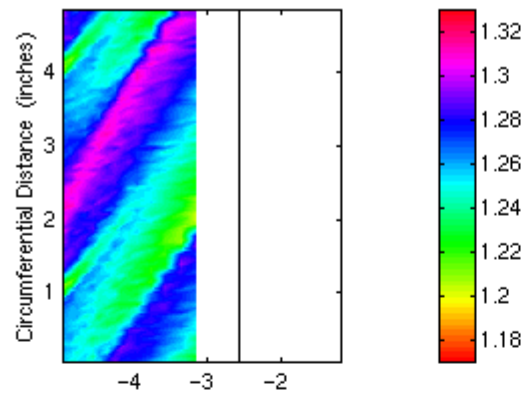
Relative Mach Number Distribution Across Rotor Rev



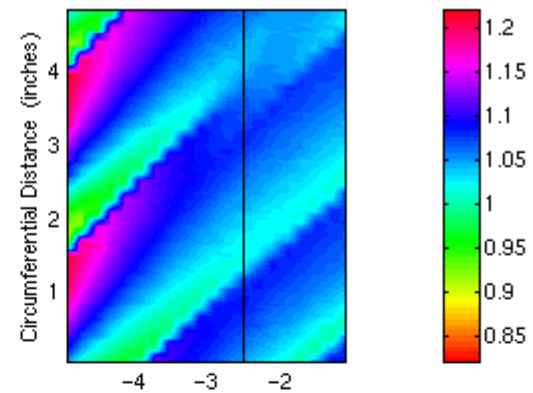
Autospectra of Relative Mach Number Distributions



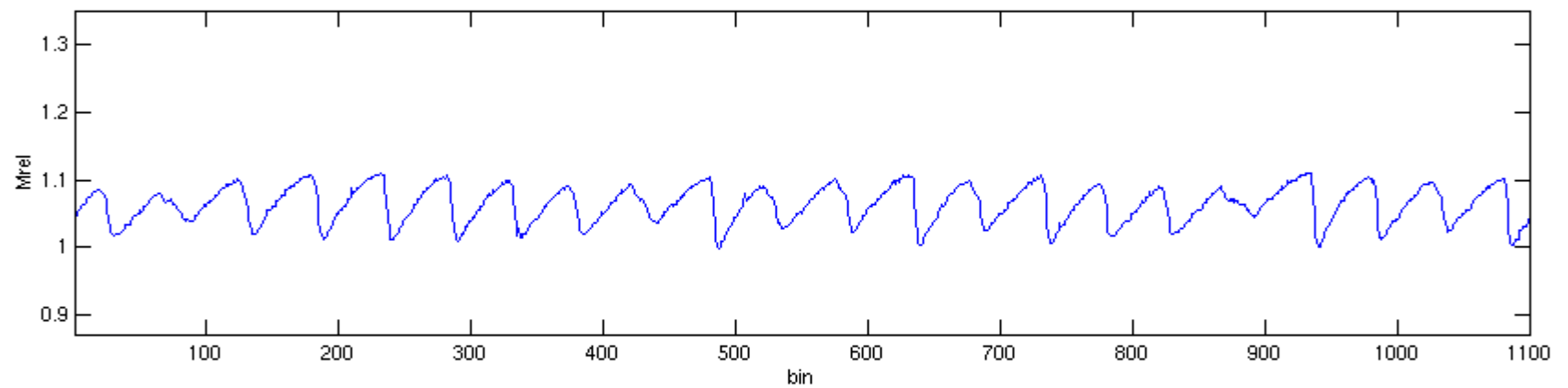
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



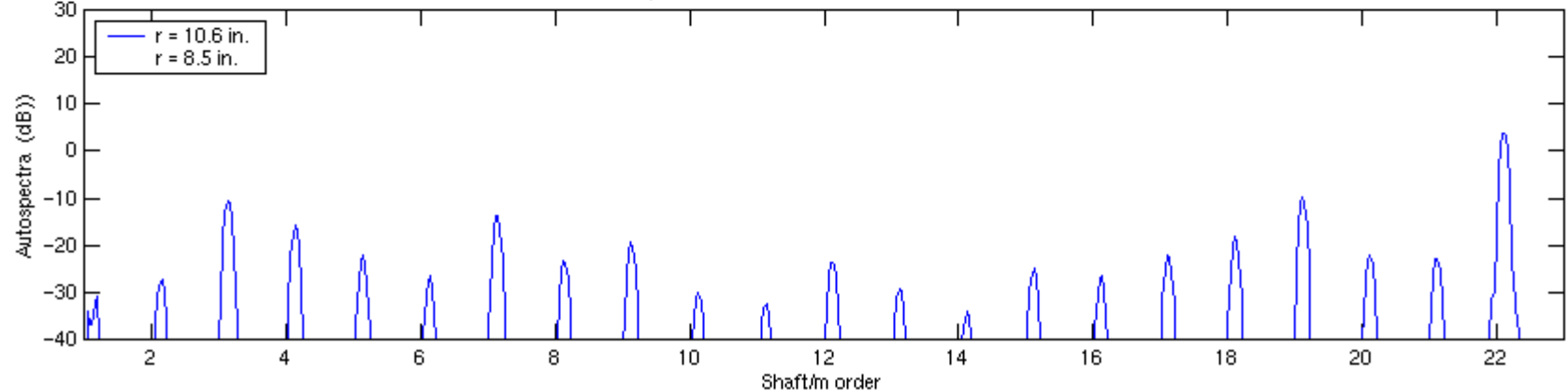
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



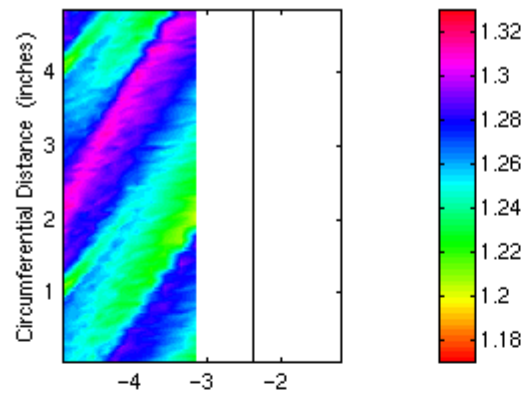
Relative Mach Number Distribution Across Rotor Rev



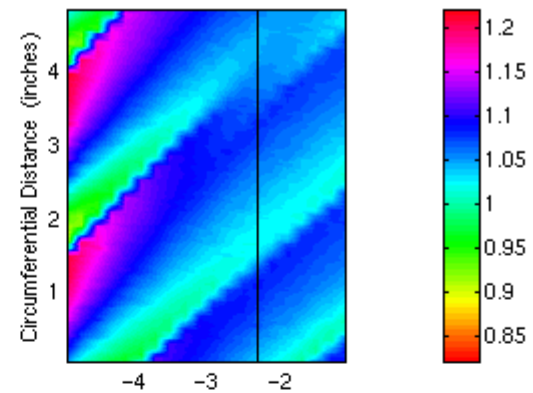
Autospectra of Relative Mach Number Distributions



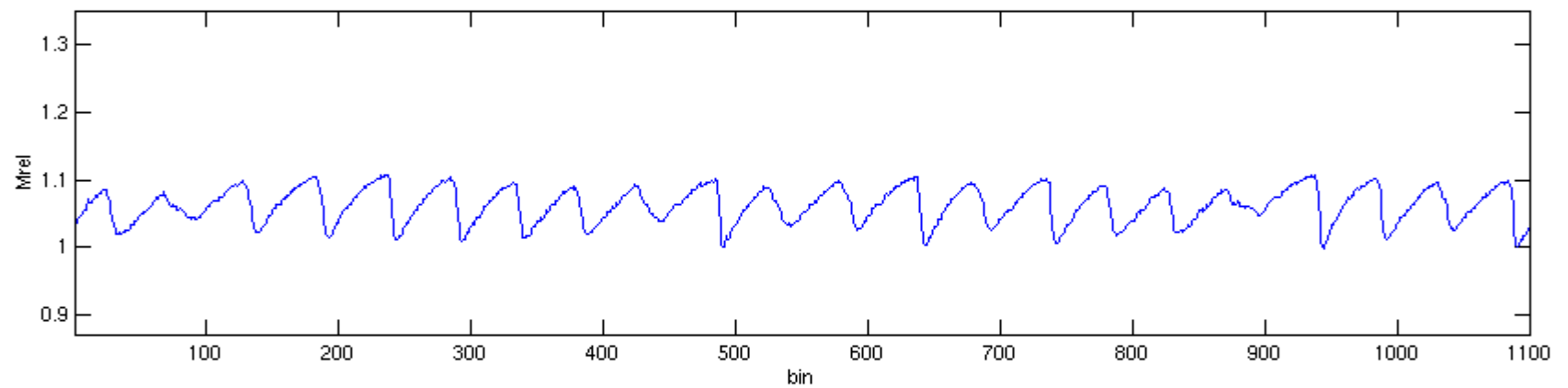
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



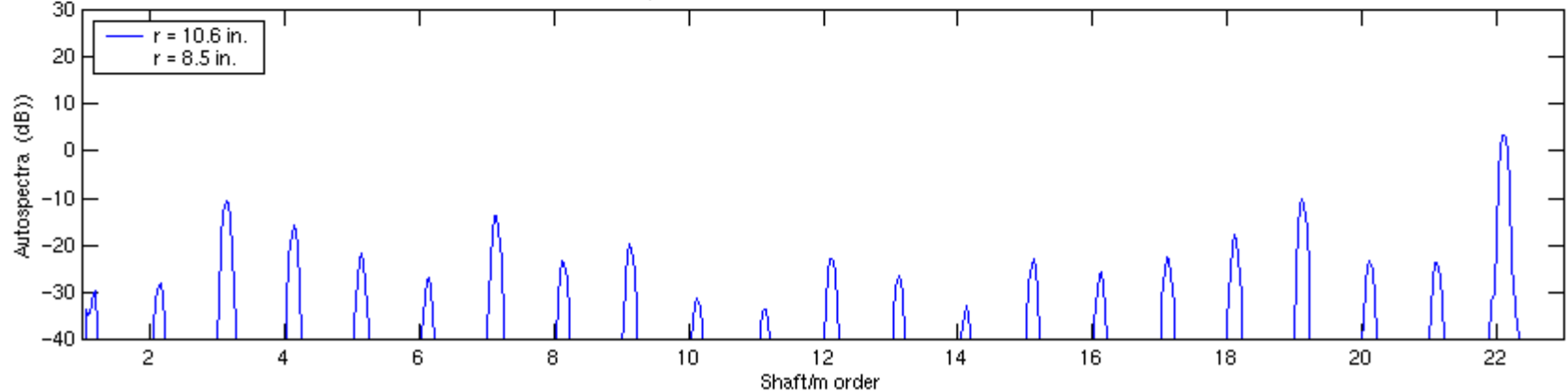
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



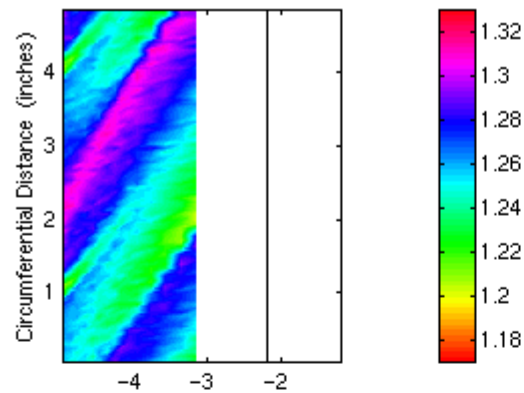
Relative Mach Number Distribution Across Rotor Rev



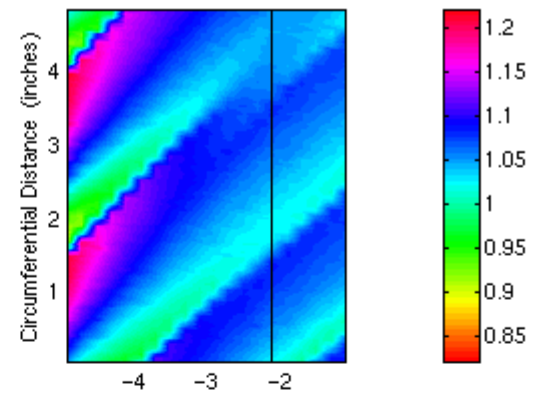
Autospectra of Relative Mach Number Distributions



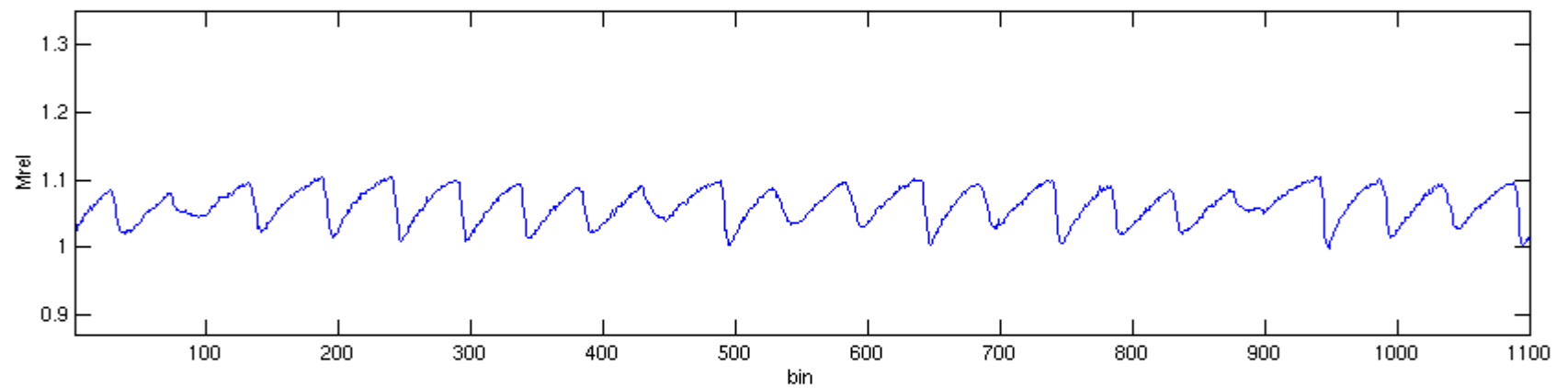
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



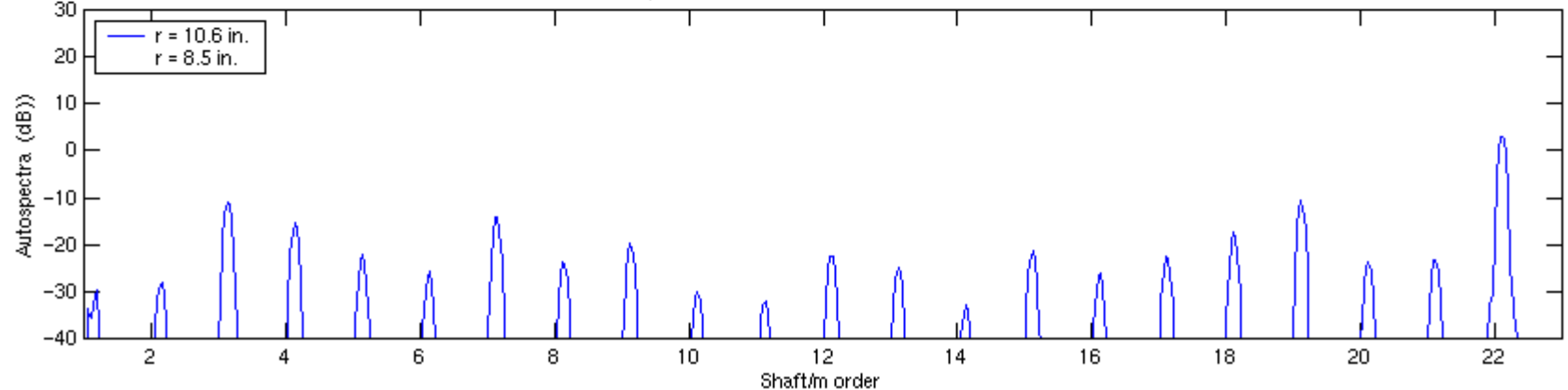
Relative Mach Number Tip Mrel=1.19 r=8.5 in.

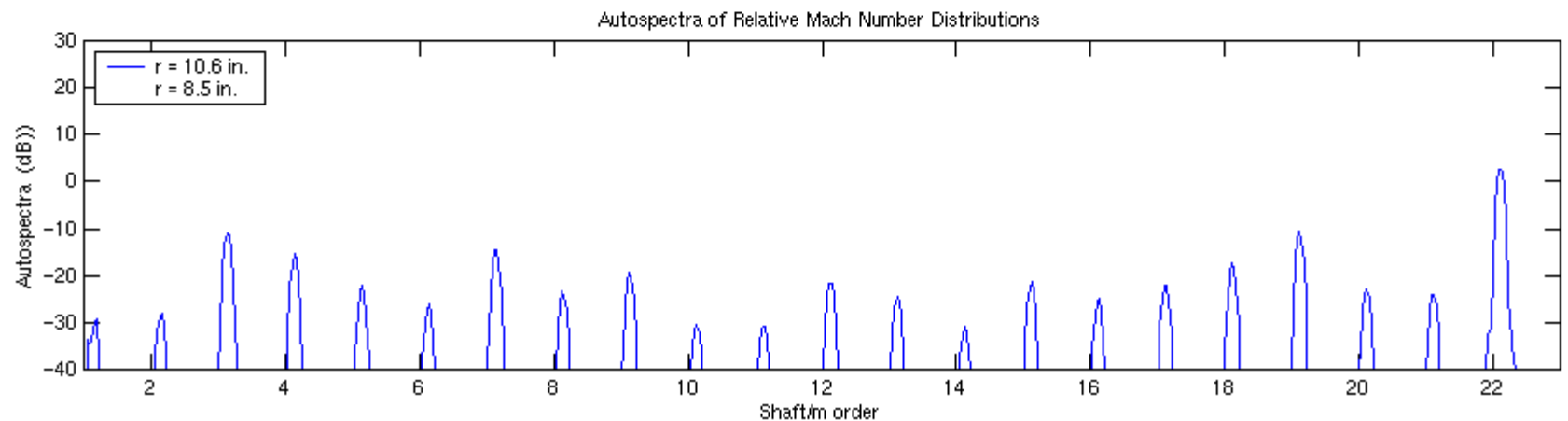
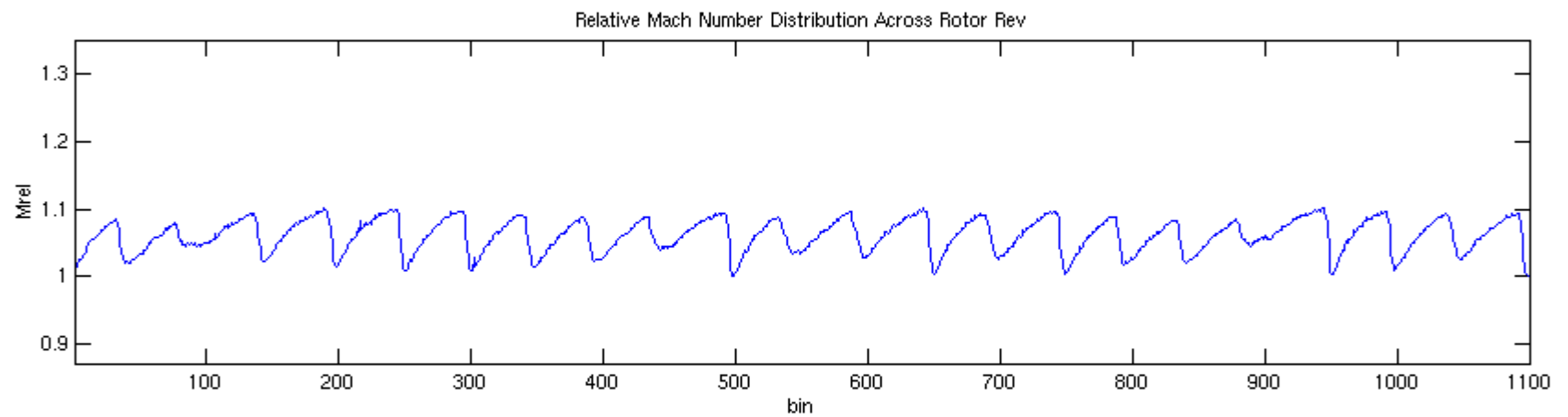
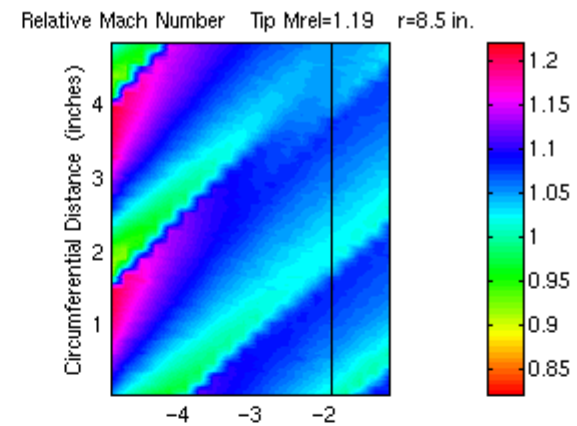
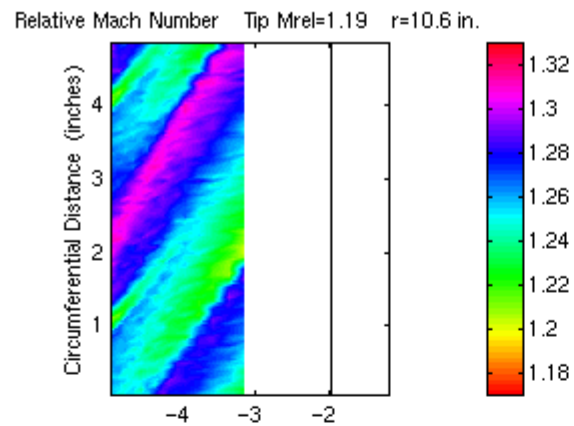


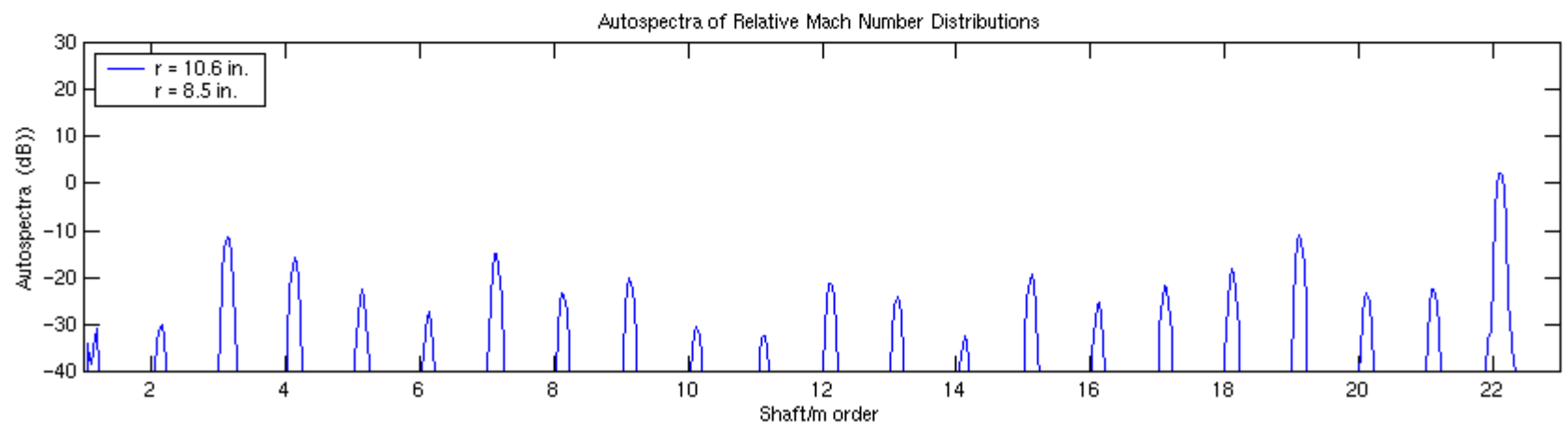
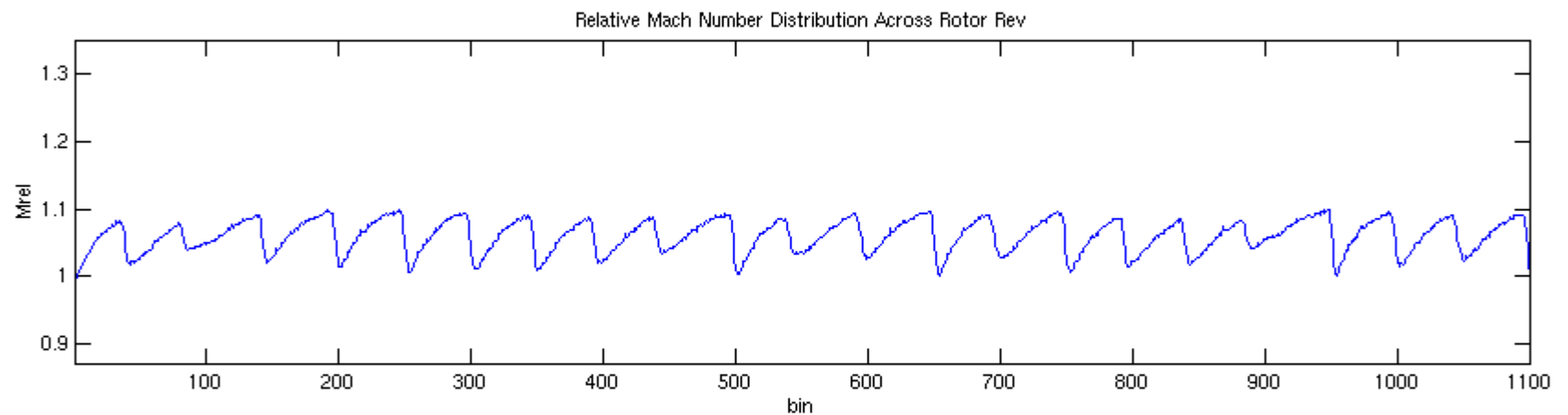
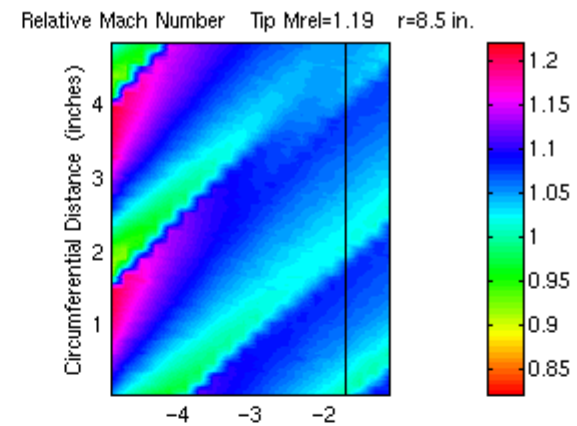
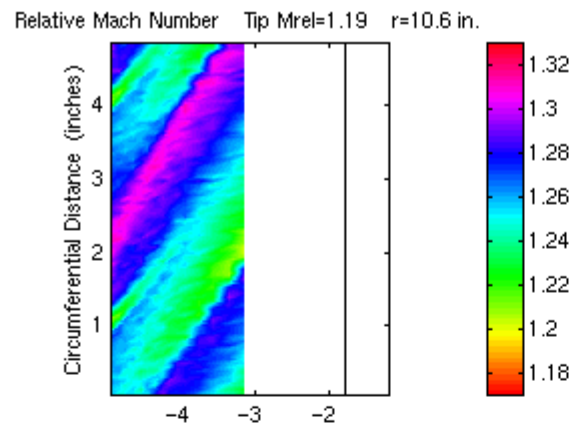
Relative Mach Number Distribution Across Rotor Rev

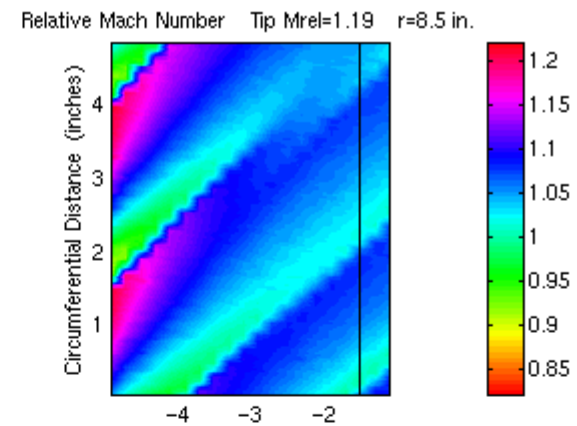
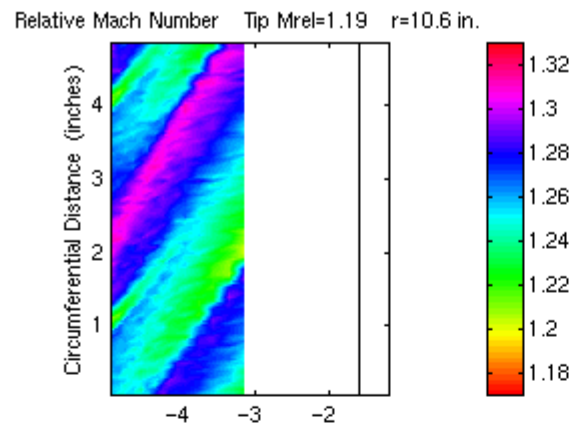


Autospectra of Relative Mach Number Distributions

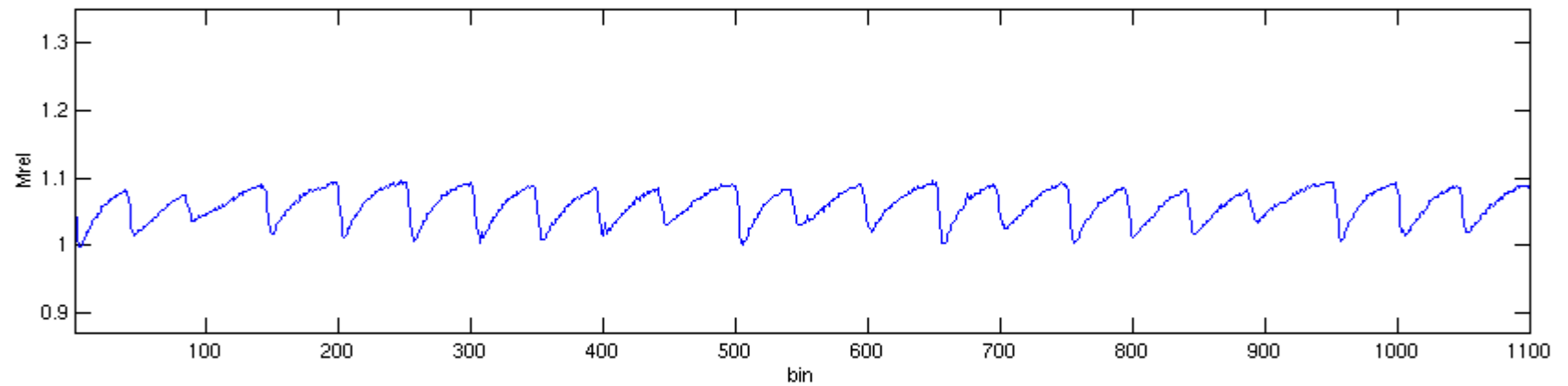




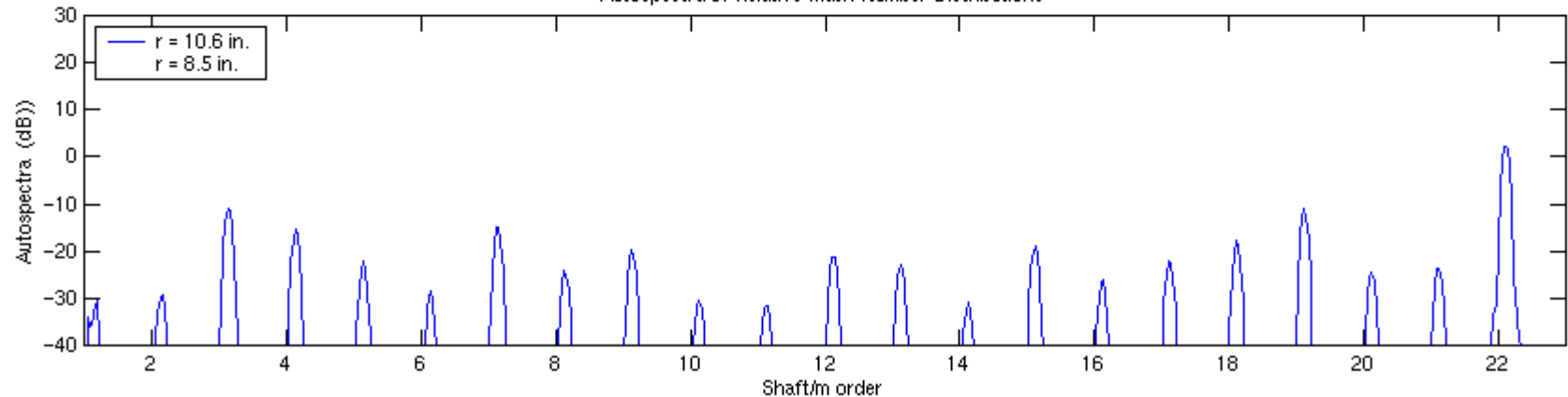




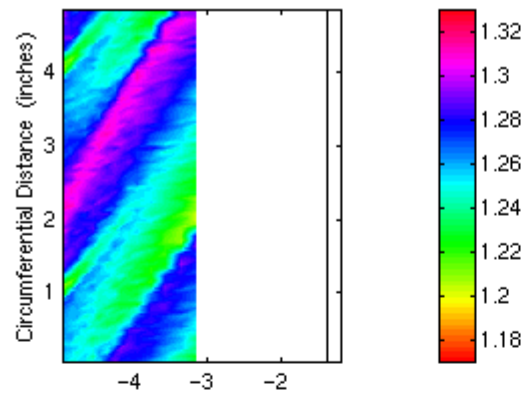
Relative Mach Number Distribution Across Rotor Rev



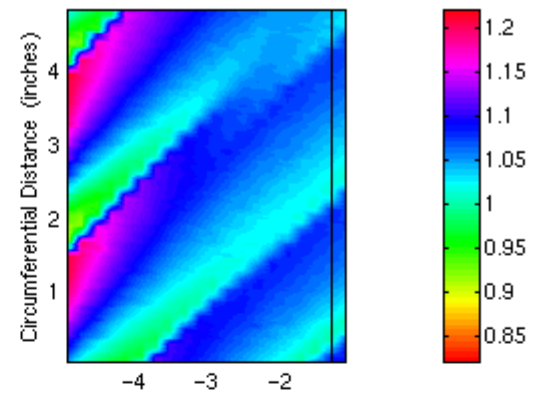
Autospectra of Relative Mach Number Distributions



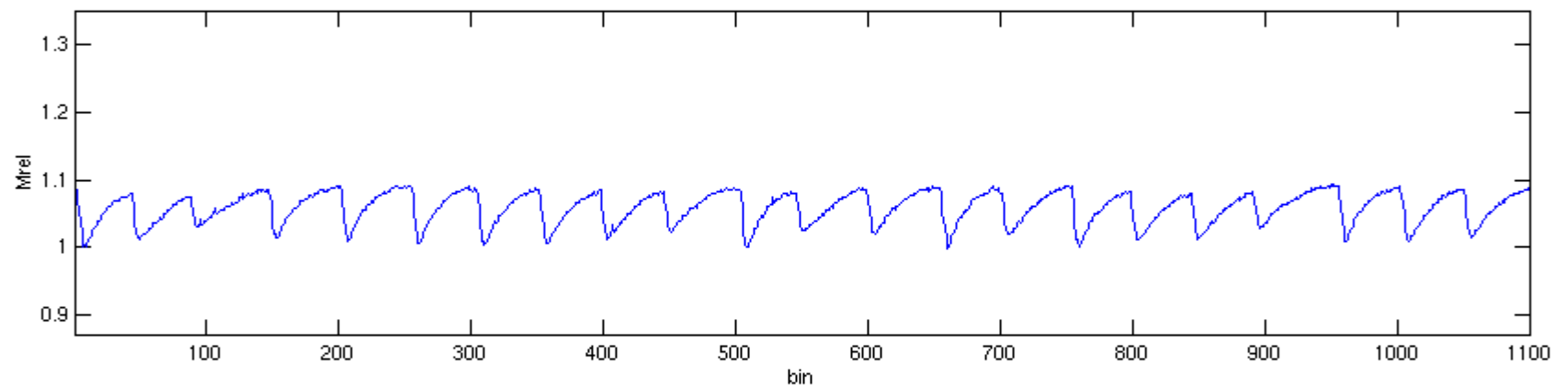
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



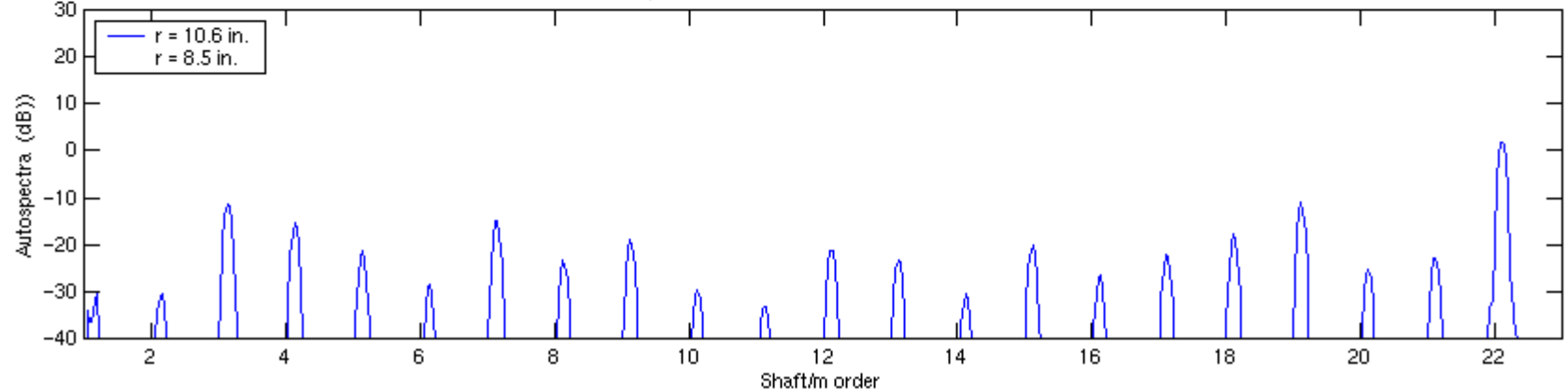
Relative Mach Number Tip Mrel=1.19 r=8.5 in.



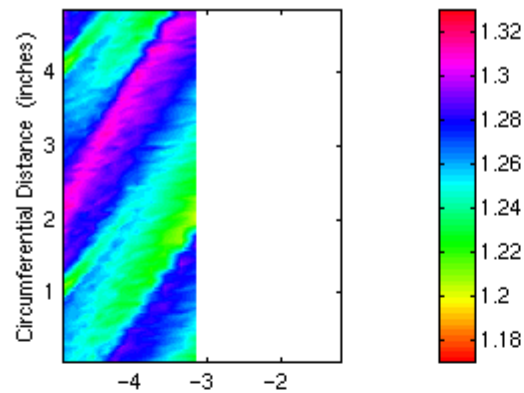
Relative Mach Number Distribution Across Rotor Rev



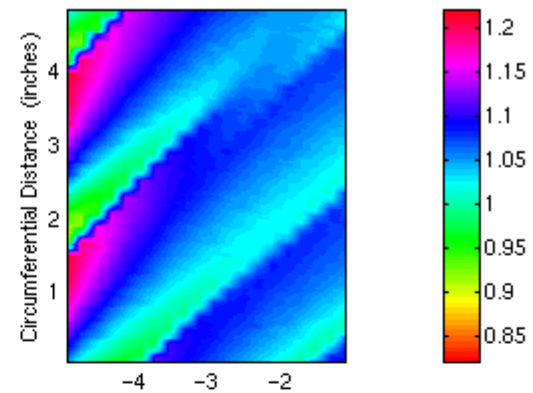
Autospectra of Relative Mach Number Distributions



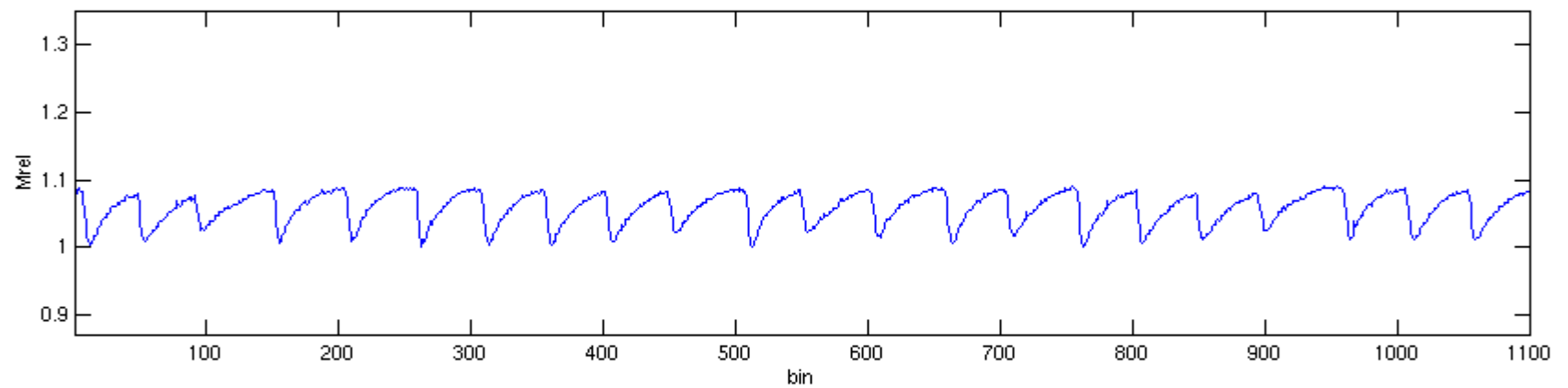
Relative Mach Number Tip Mrel=1.19 r=10.6 in.



Relative Mach Number Tip Mrel=1.19 r=8.5 in.



Relative Mach Number Distribution Across Rotor Rev



Autospectra of Relative Mach Number Distributions

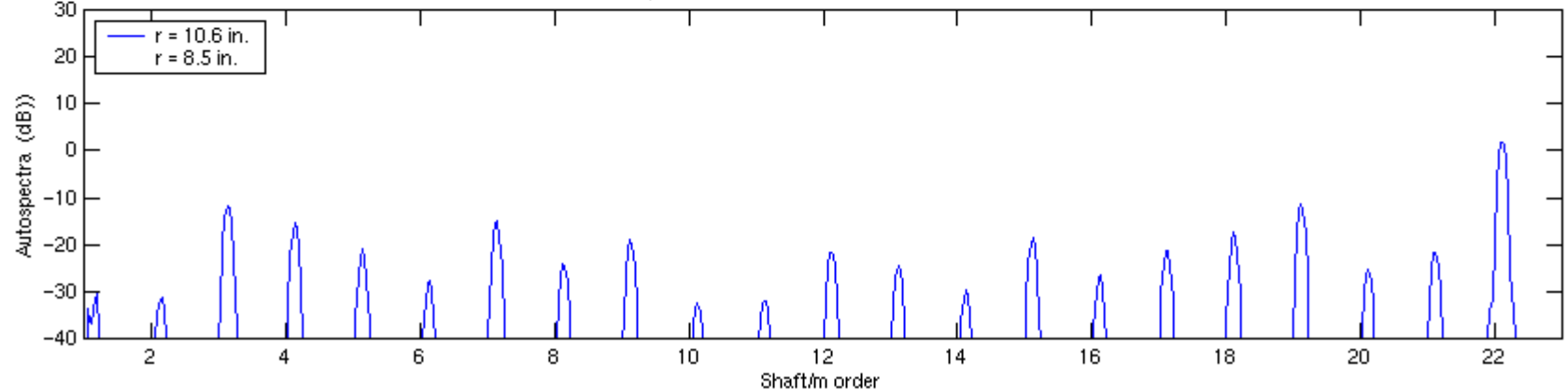


Figure 15.—The plot at the right shows the variation in the average amplitude of the disturbance measured upstream of the forward-swept fan with distance upstream of the leading edge at $r = 10.6$ in. (blue) and $r = 8.5$ in. (black).

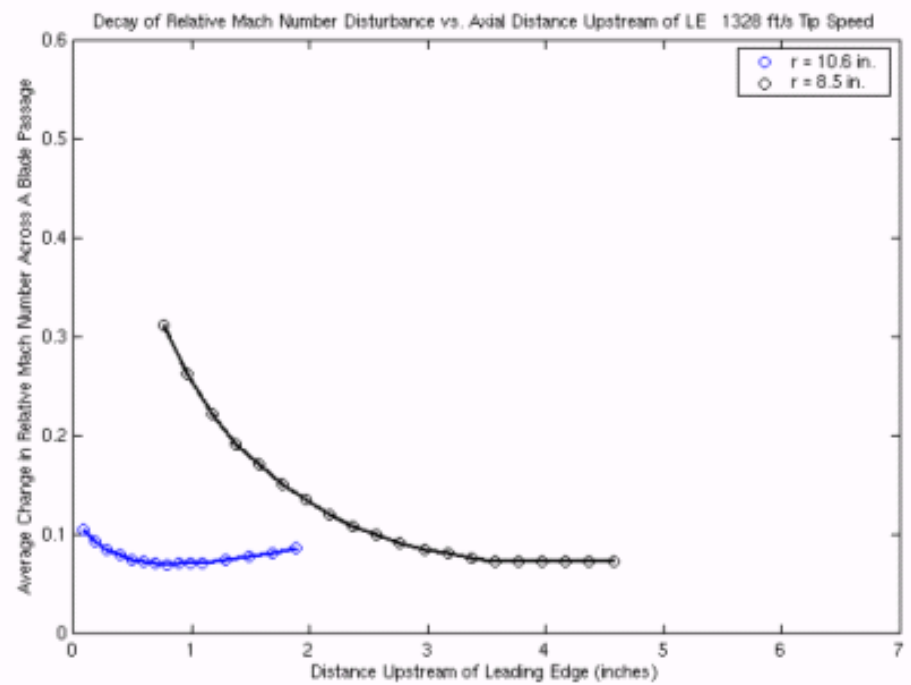
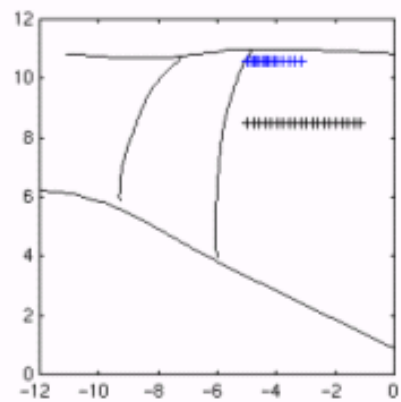
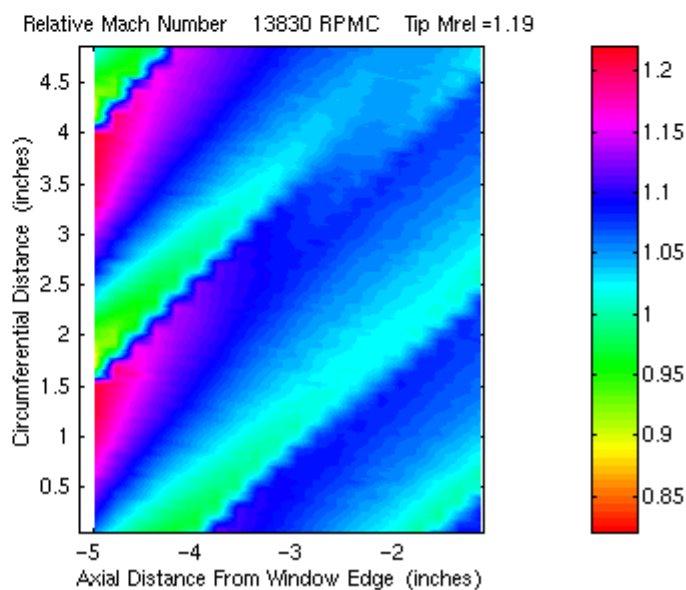
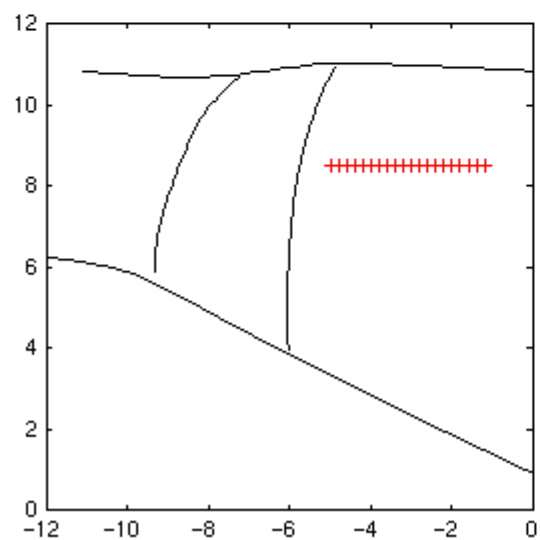
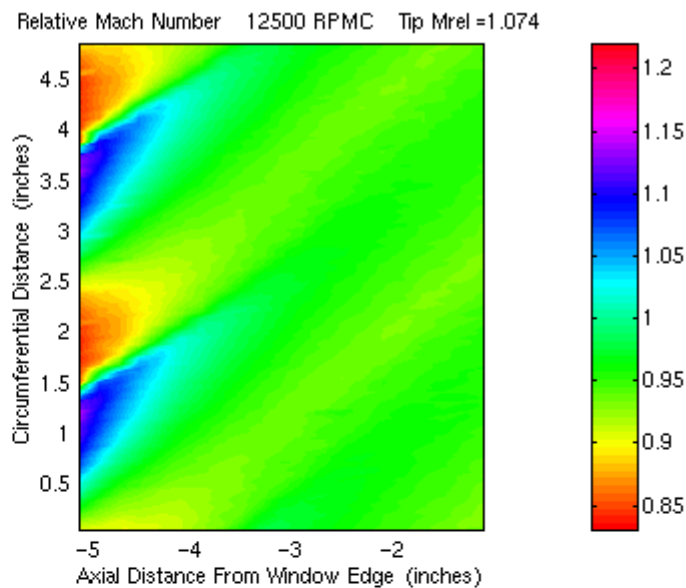
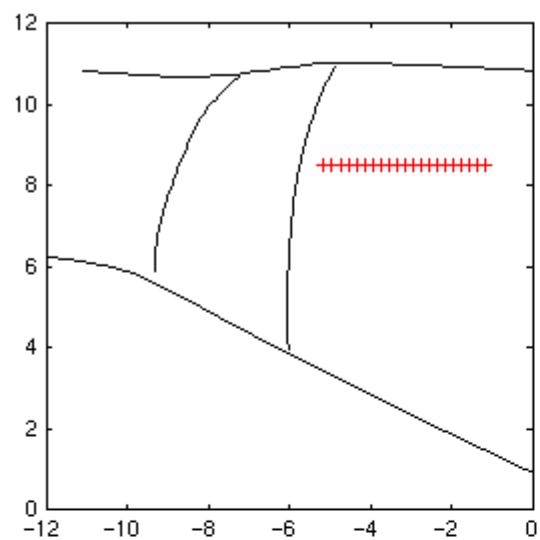
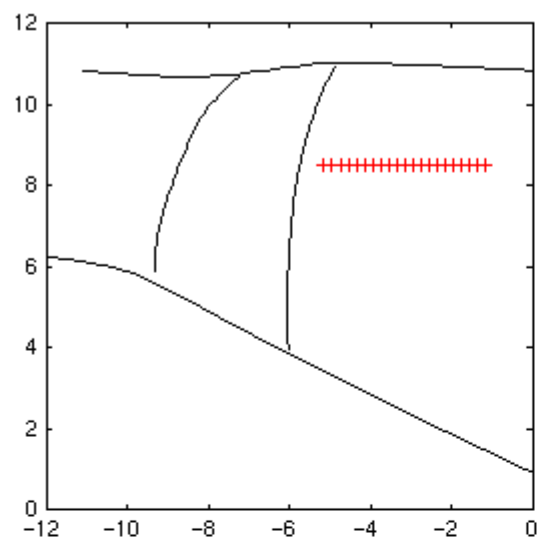
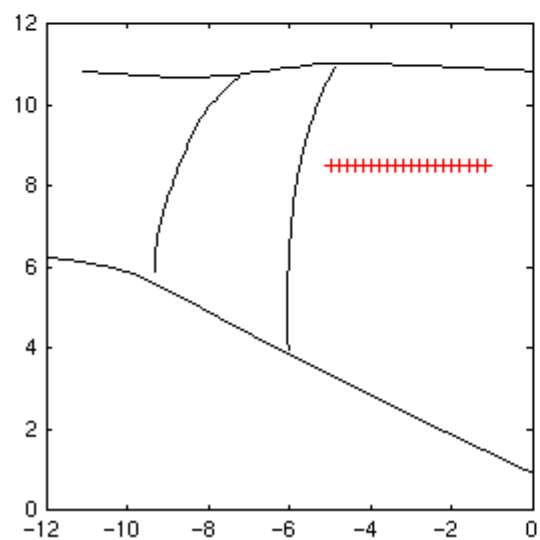
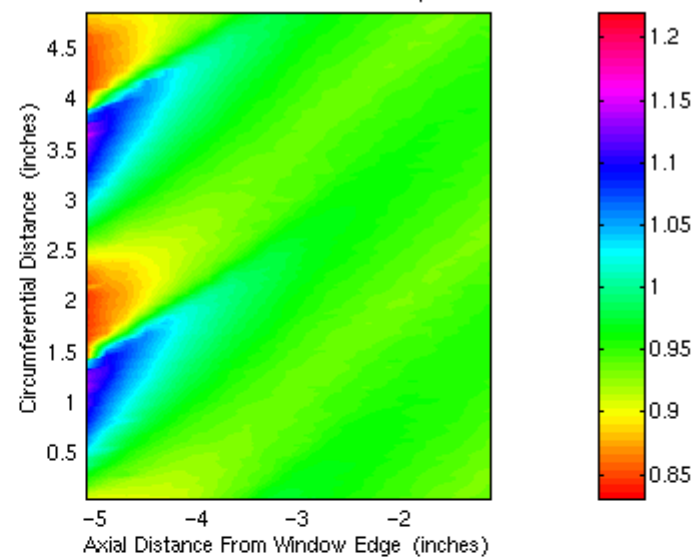


Figure 16.—Slideshow (22 slides) illustrating the blade-to-blade variations in the flow measured upstream of the forward-swept fan at $r = 8.5$ in. with the rotor operating at both the mid-speed (top contours) and high-speed (bottom) conditions.

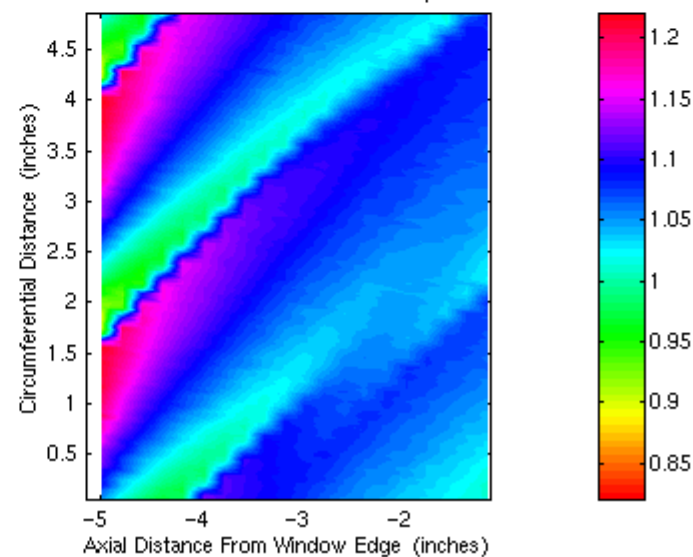


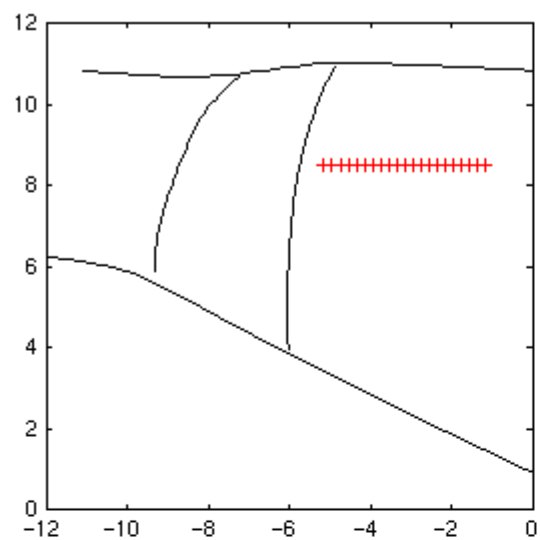


Relative Mach Number 12500 RPMC Tip Mrel = 1.074

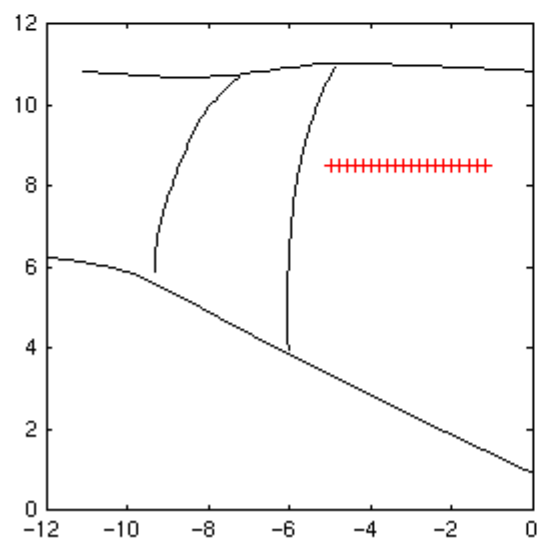
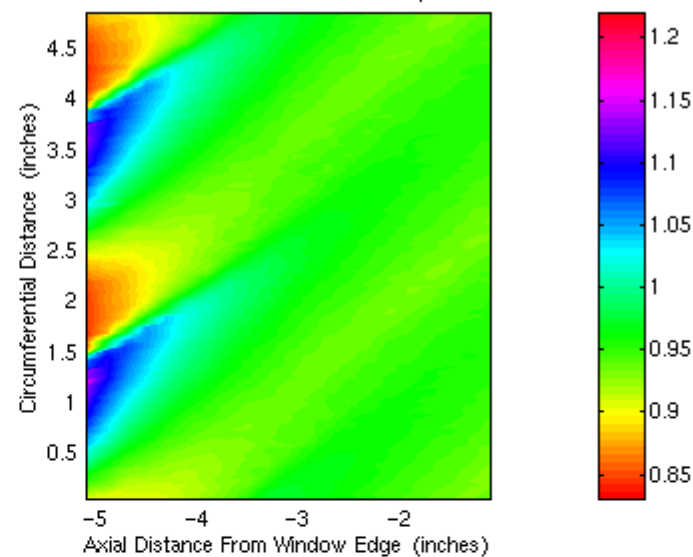


Relative Mach Number 13830 RPMC Tip Mrel = 1.19

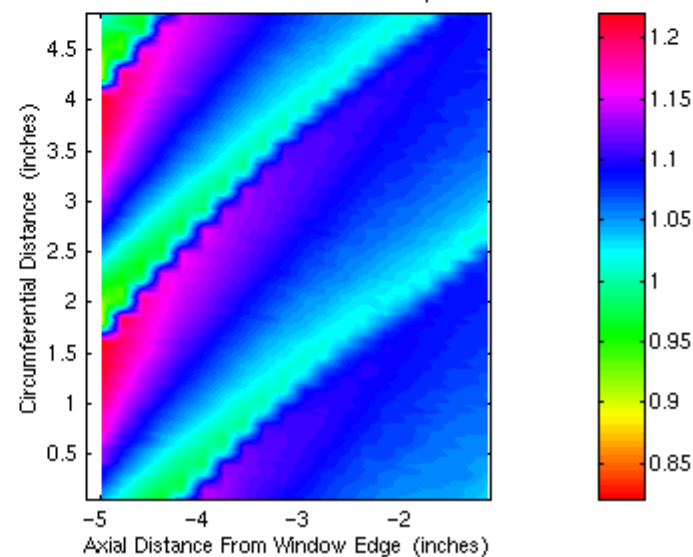


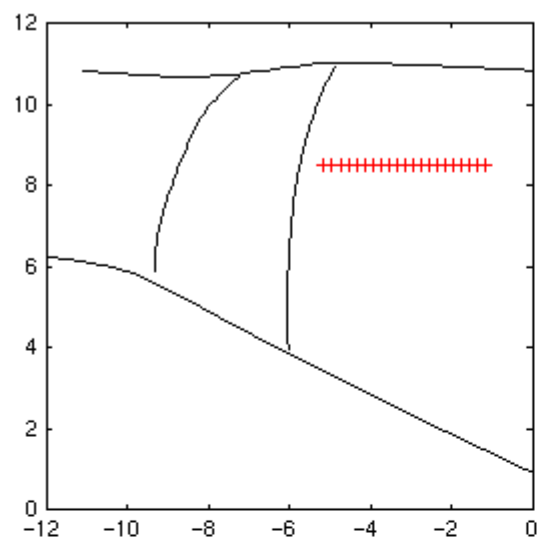


Relative Mach Number 12500 RPMC Tip Mrel = 1.074

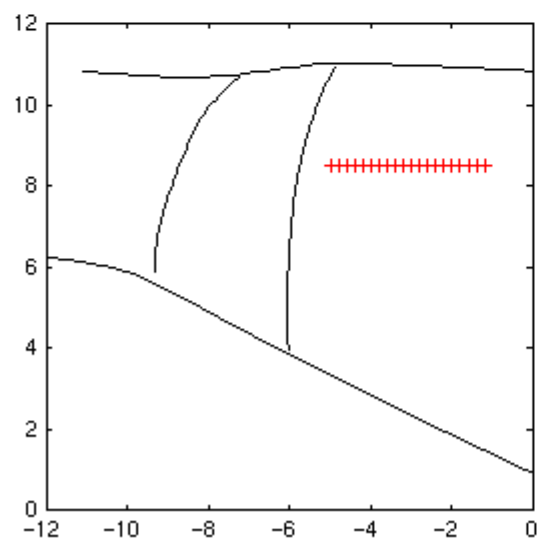
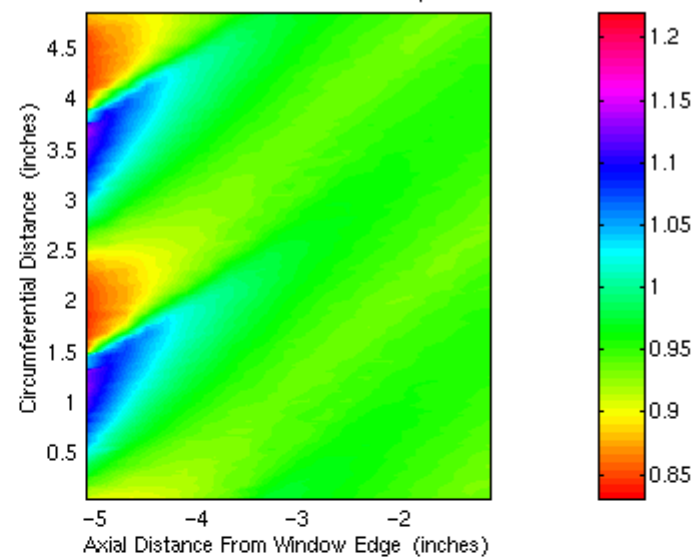


Relative Mach Number 13830 RPMC Tip Mrel = 1.19

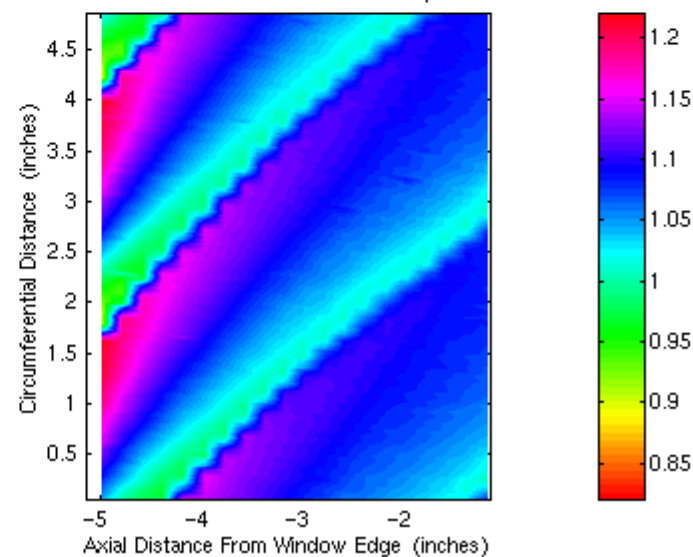


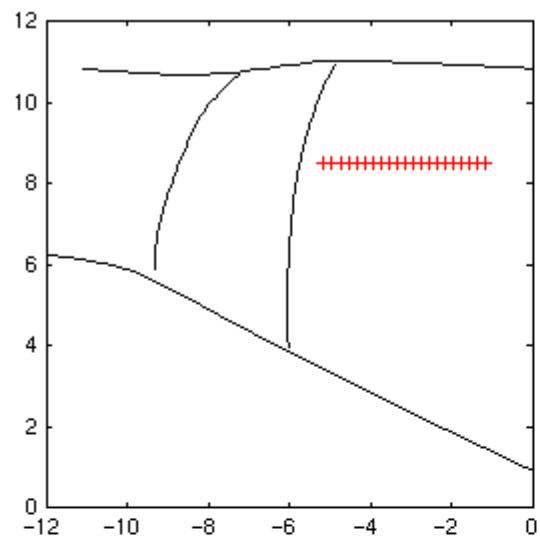


Relative Mach Number 12500 RPMC Tip Mrel =1.074

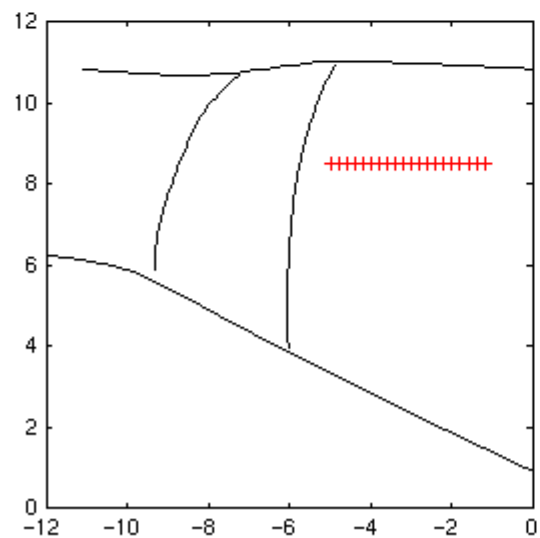
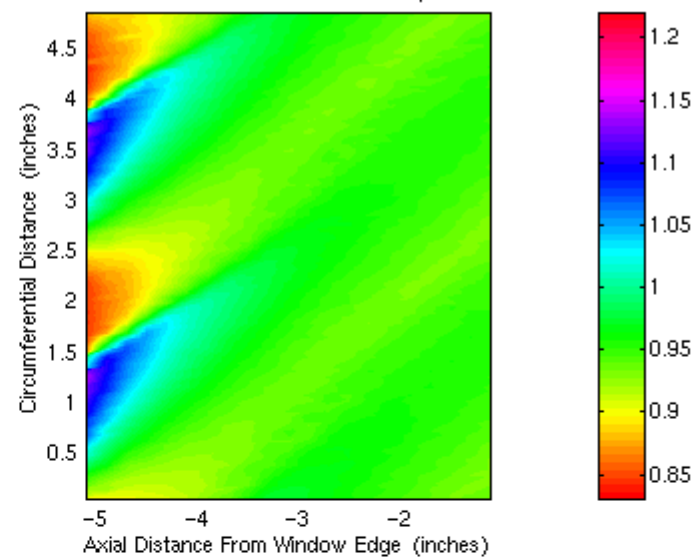


Relative Mach Number 13830 RPMC Tip Mrel =1.19

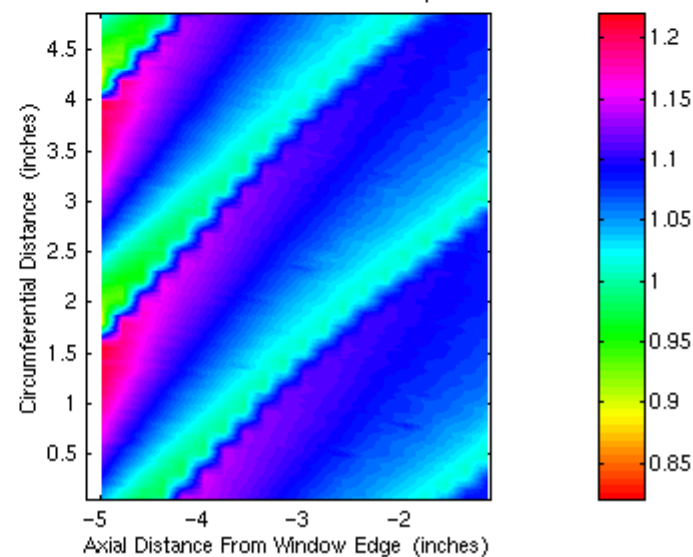


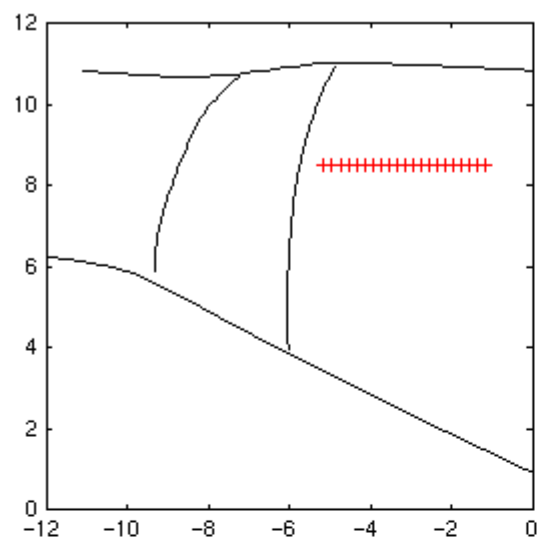


Relative Mach Number 12500 RPMC Tip Mrel =1.074

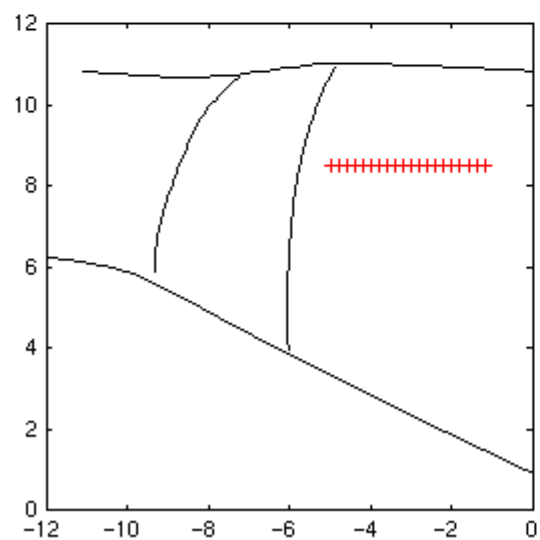
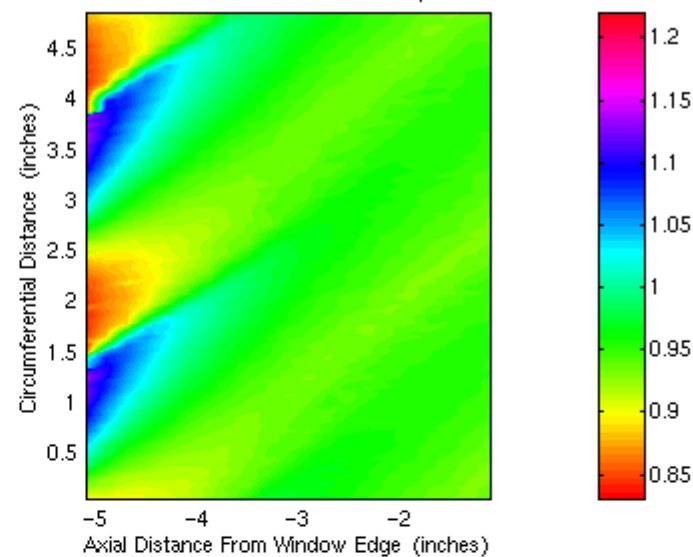


Relative Mach Number 13830 RPMC Tip Mrel =1.19

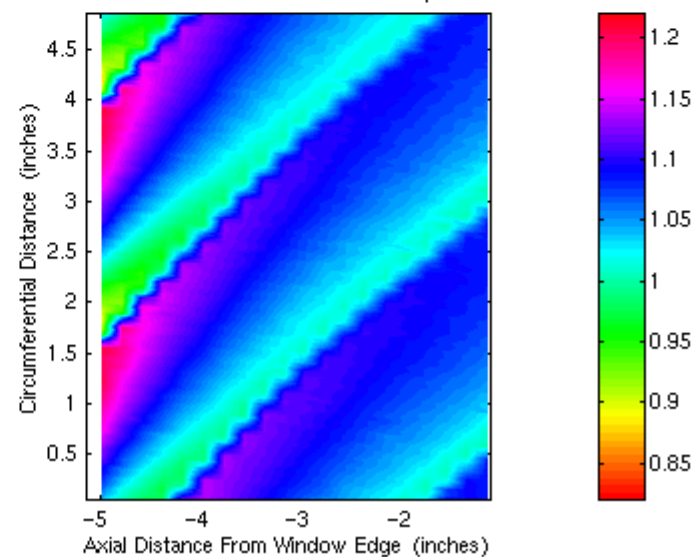


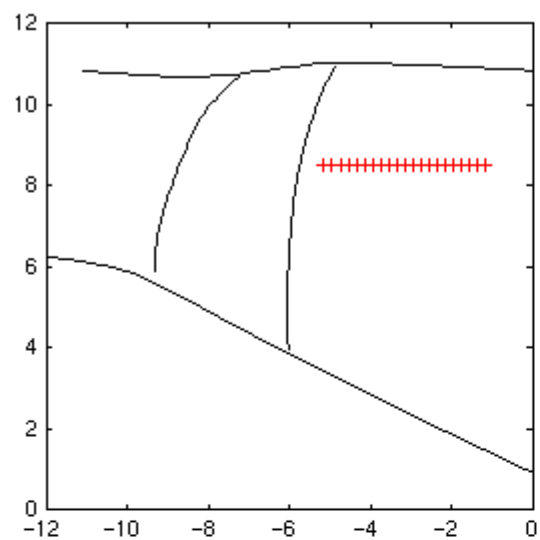


Relative Mach Number 12500 RPM Tip Mrel = 1.074

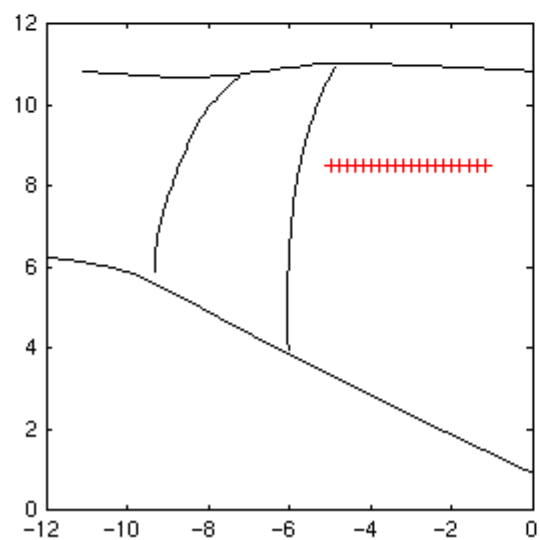
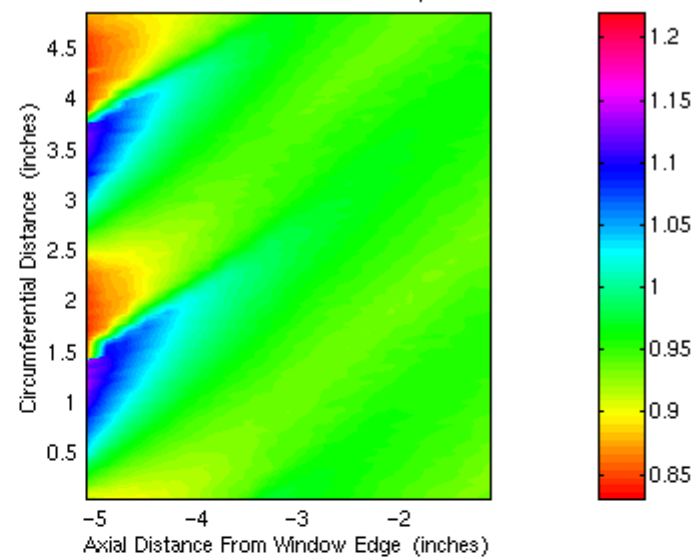


Relative Mach Number 13830 RPM Tip Mrel = 1.19

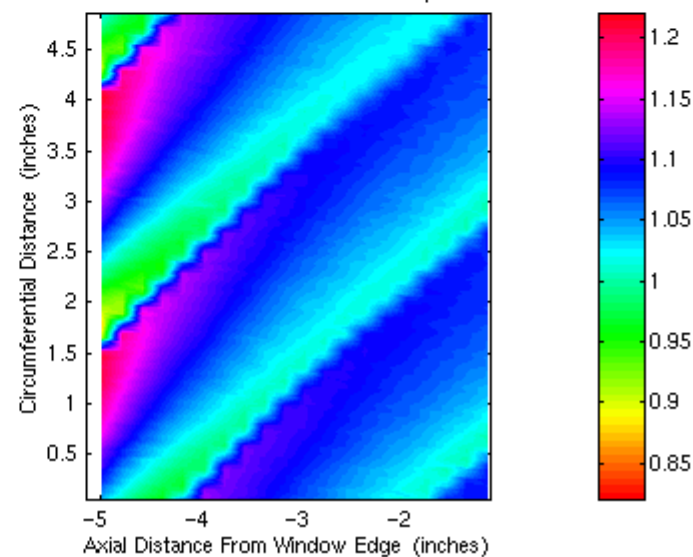


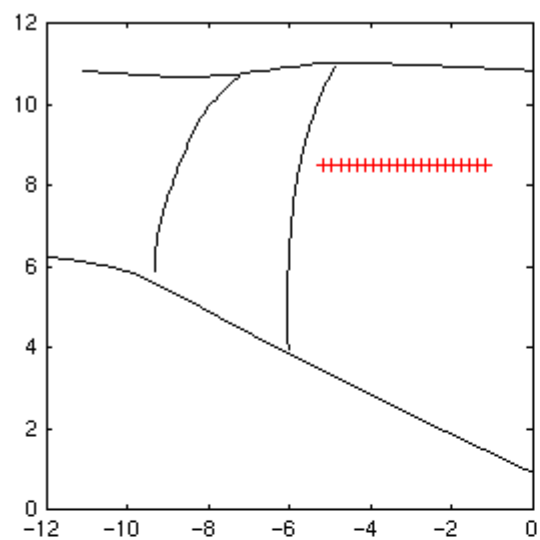


Relative Mach Number 12500 RPM Tip Mrel = 1.074

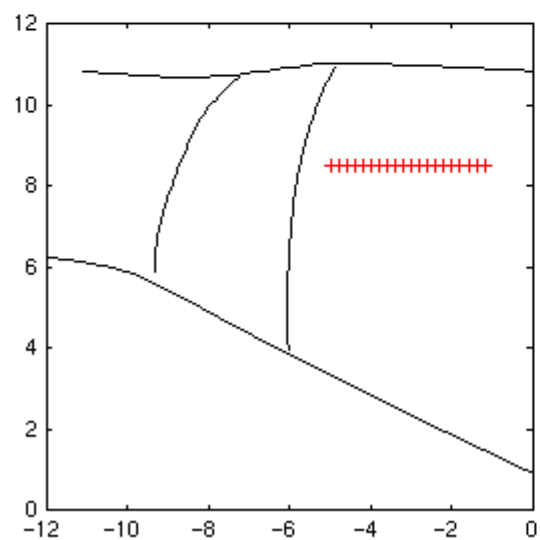
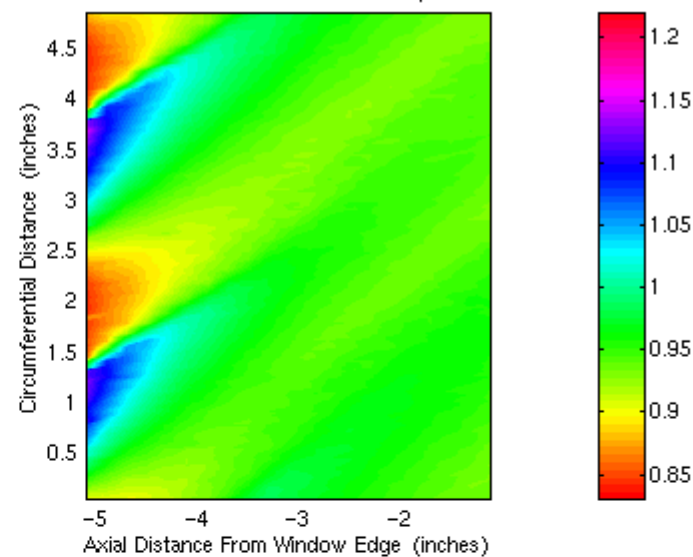


Relative Mach Number 13830 RPM Tip Mrel = 1.19

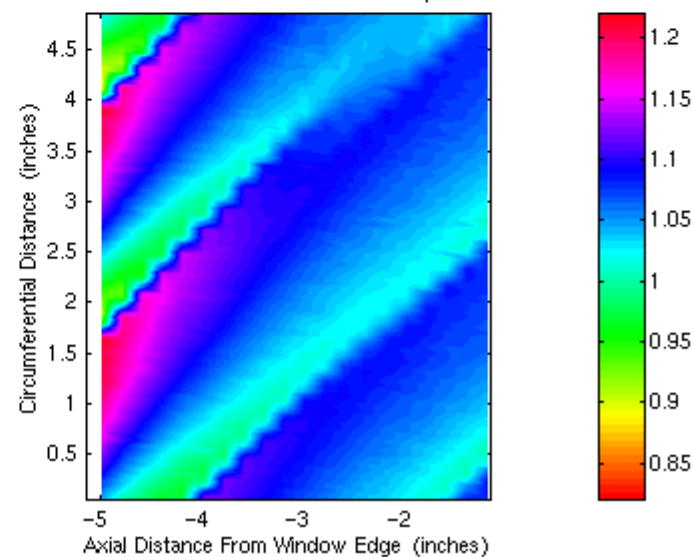


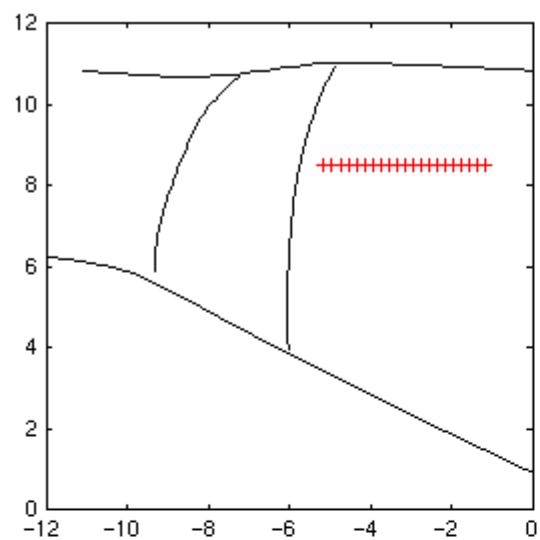


Relative Mach Number 12500 RPM Tip Mrel = 1.074

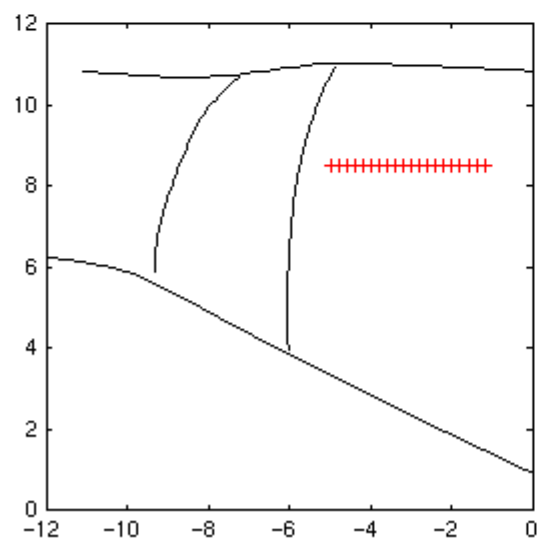
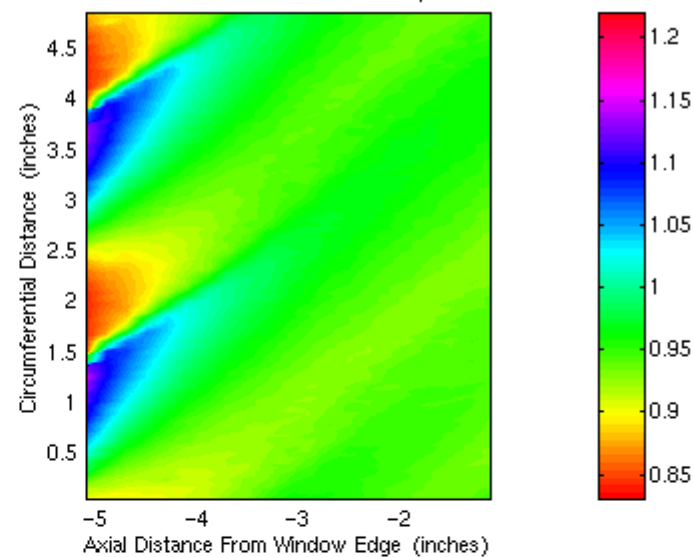


Relative Mach Number 13830 RPM Tip Mrel = 1.19

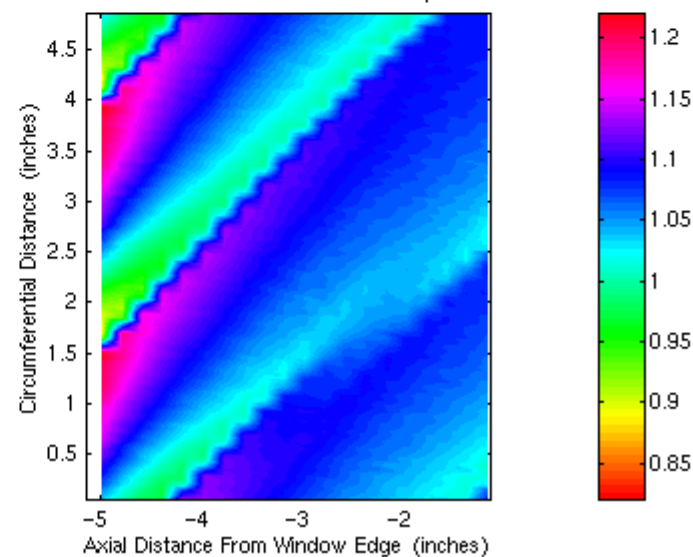


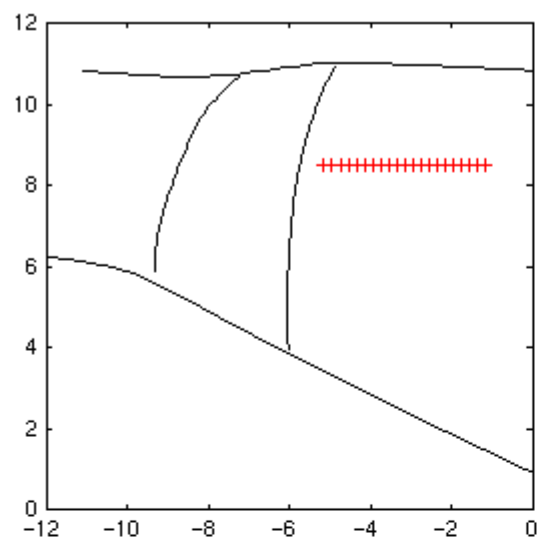


Relative Mach Number 12500 RPMC Tip Mrel =1.074

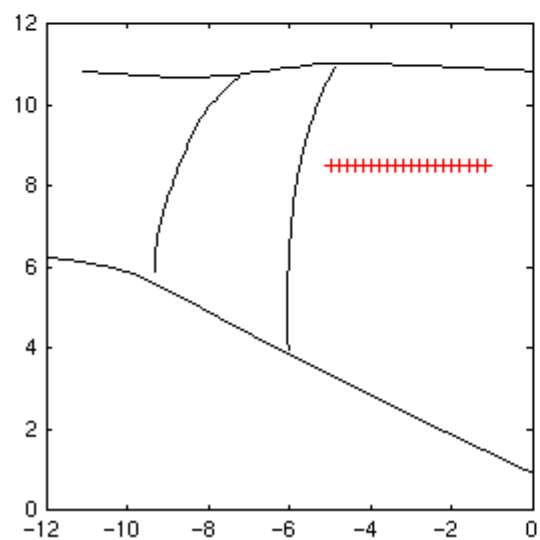
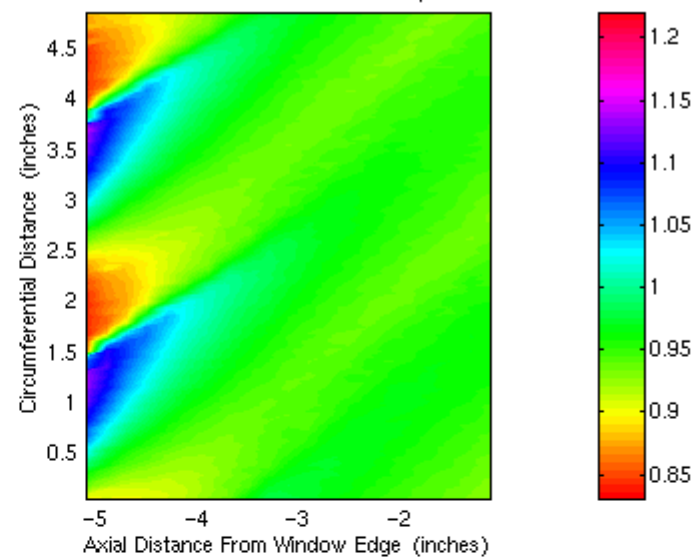


Relative Mach Number 13830 RPMC Tip Mrel =1.19

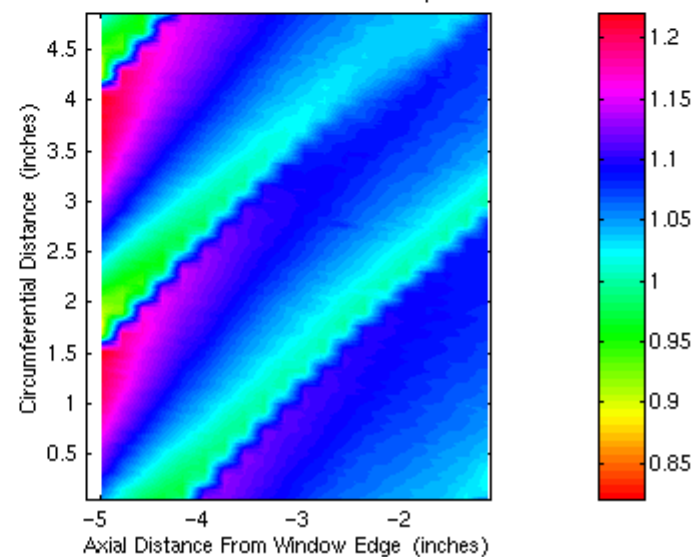


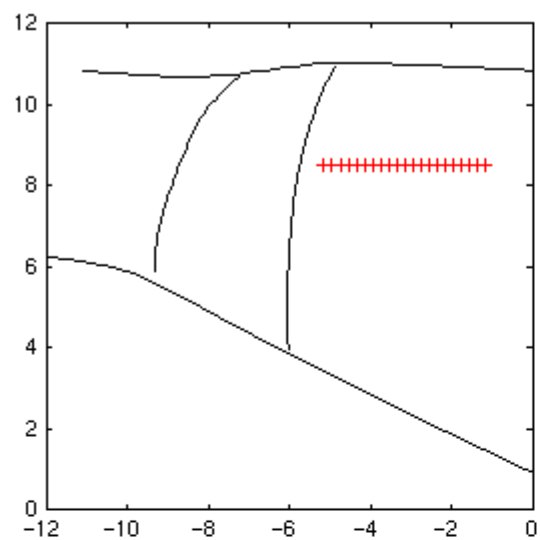


Relative Mach Number 12500 RPM Tip Mrel = 1.074

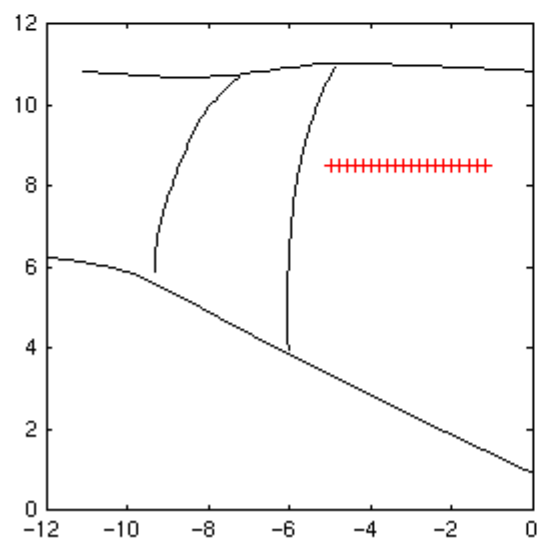
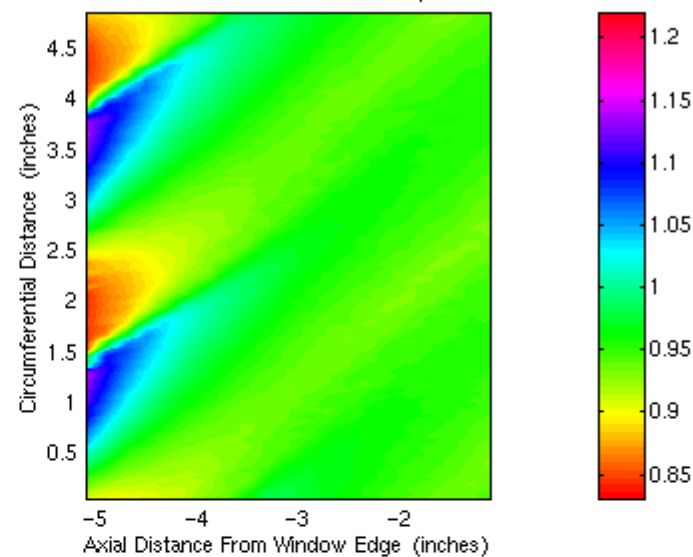


Relative Mach Number 13830 RPM Tip Mrel = 1.19

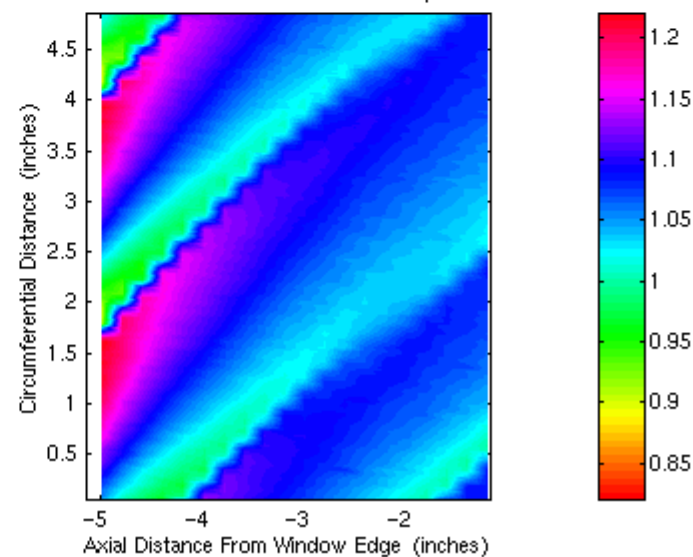


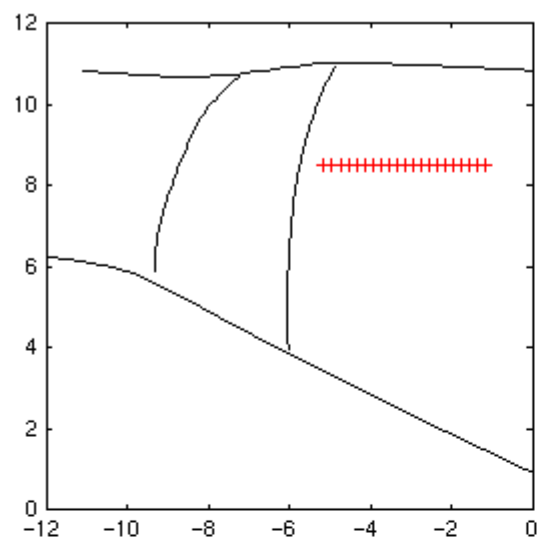


Relative Mach Number 12500 RPMC Tip Mrel =1.074

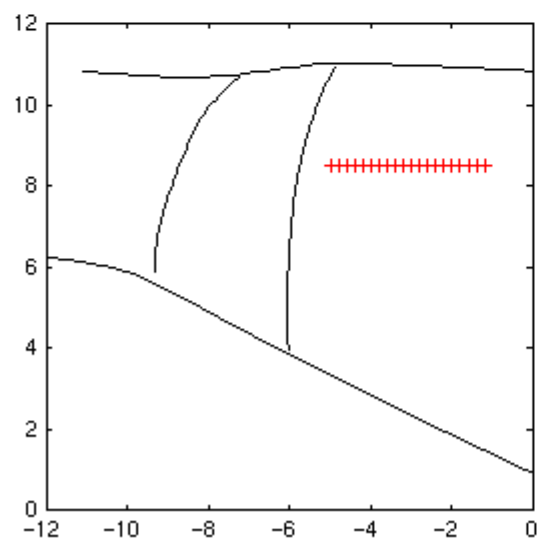
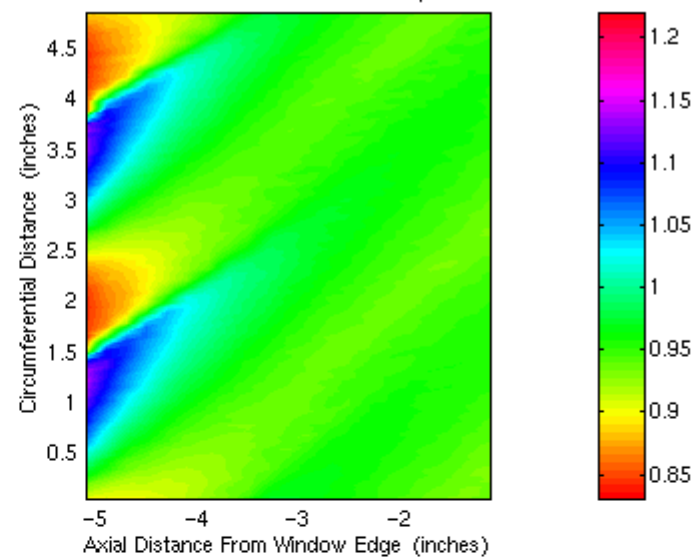


Relative Mach Number 13830 RPMC Tip Mrel =1.19

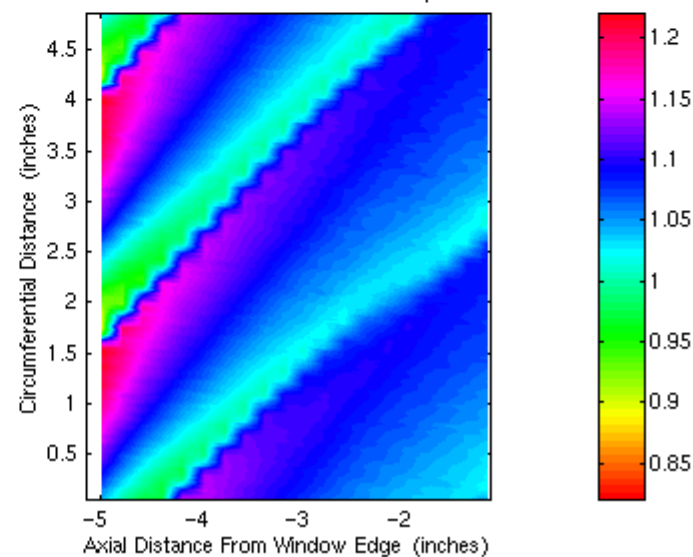


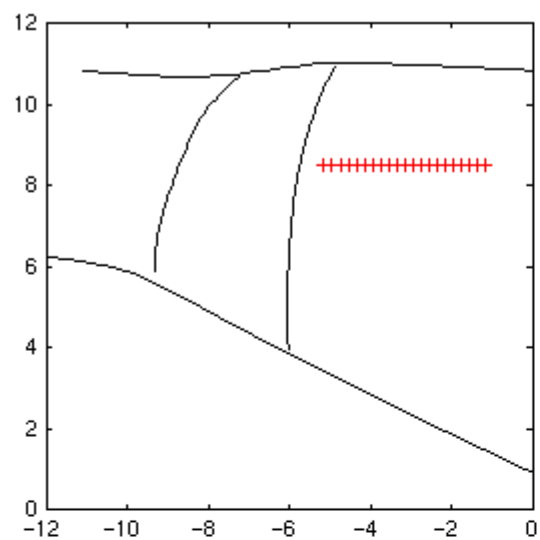


Relative Mach Number 12500 RPMC Tip Mrel =1.074

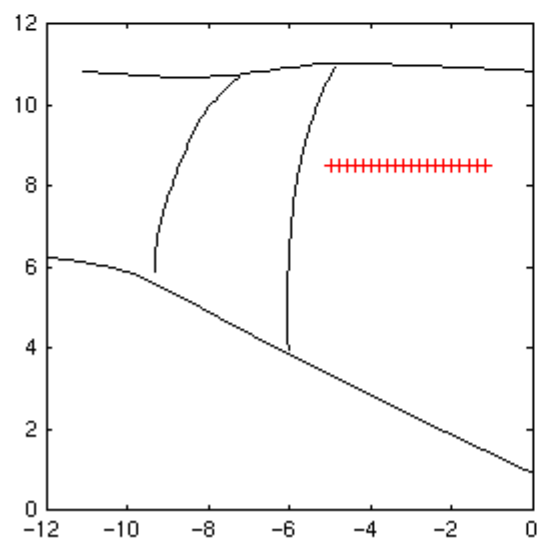
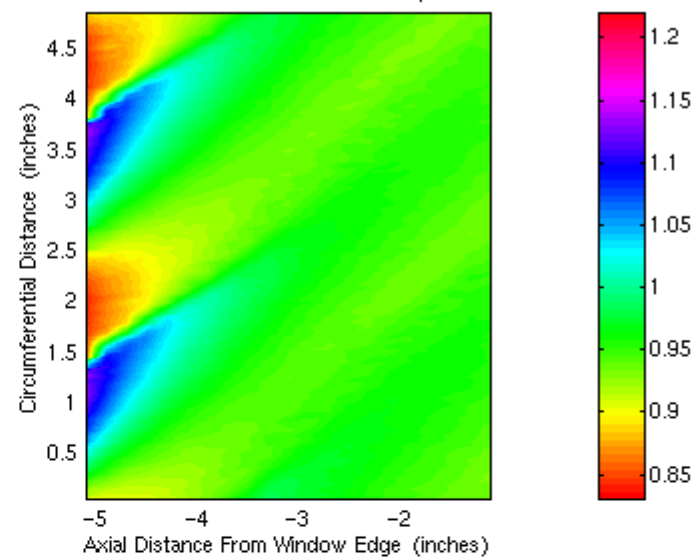


Relative Mach Number 13830 RPMC Tip Mrel =1.19

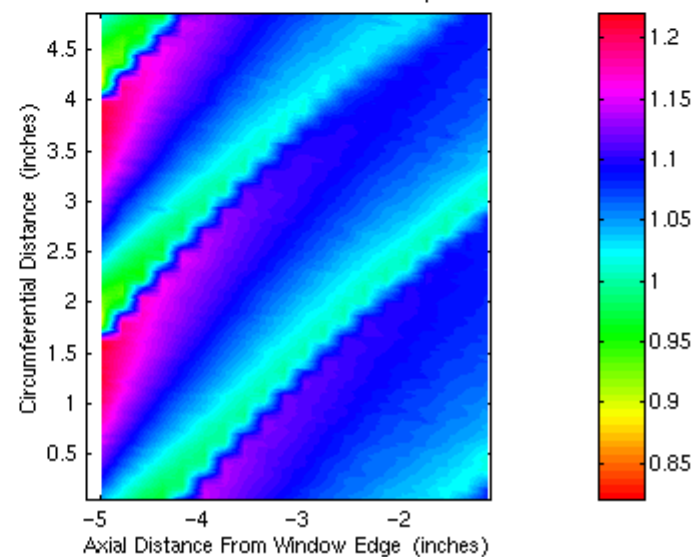


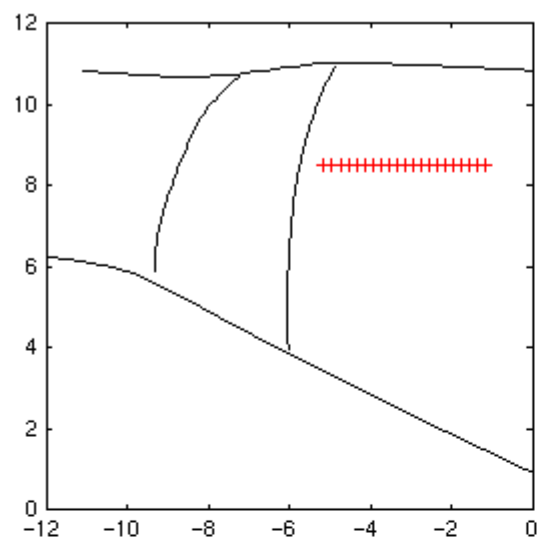


Relative Mach Number 12500 RPMC Tip Mrel =1.074

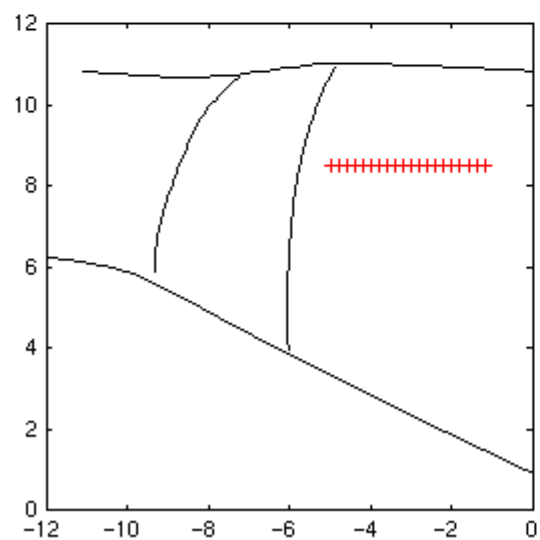
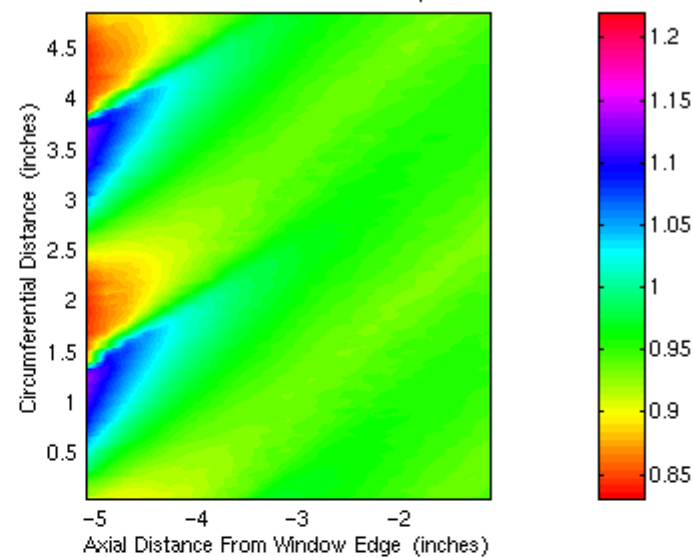


Relative Mach Number 13830 RPMC Tip Mrel =1.19

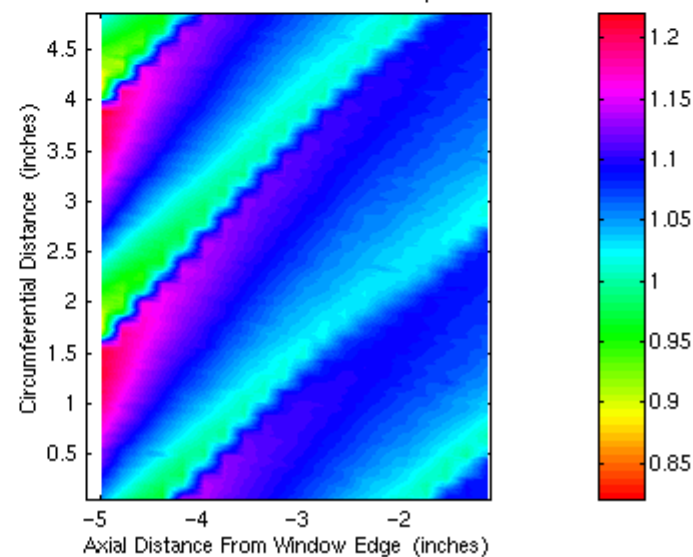


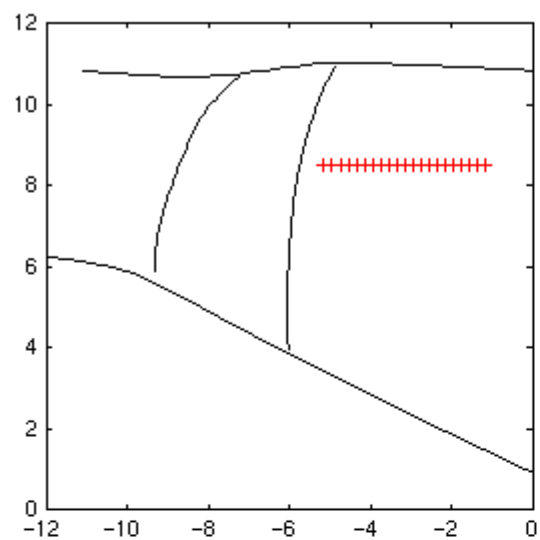


Relative Mach Number 12500 RPMC Tip Mrel =1.074

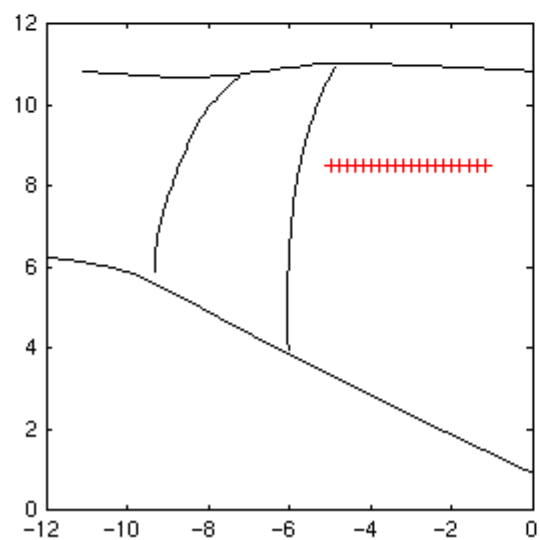
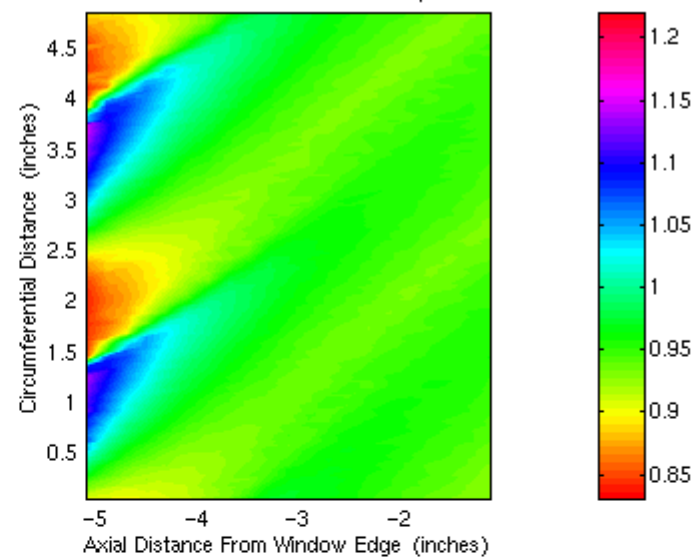


Relative Mach Number 13830 RPMC Tip Mrel =1.19

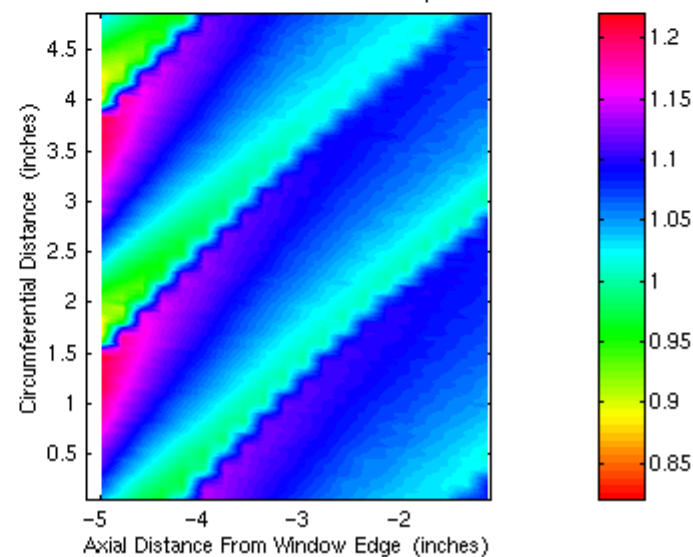


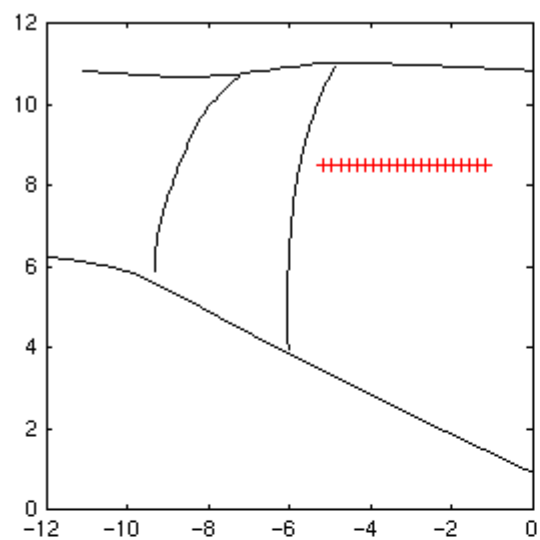


Relative Mach Number 12500 RPMC Tip Mrel =1.074

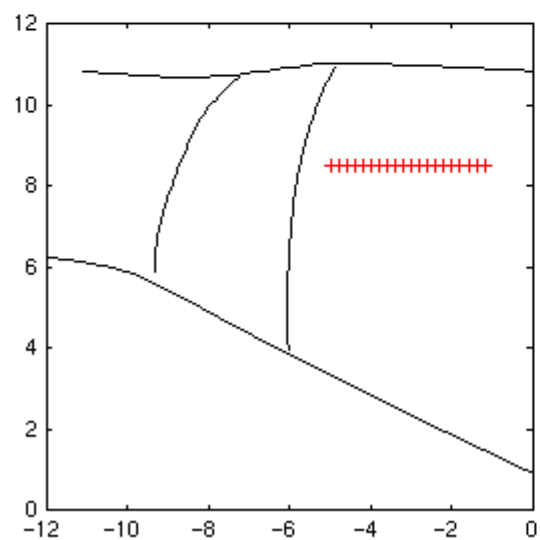
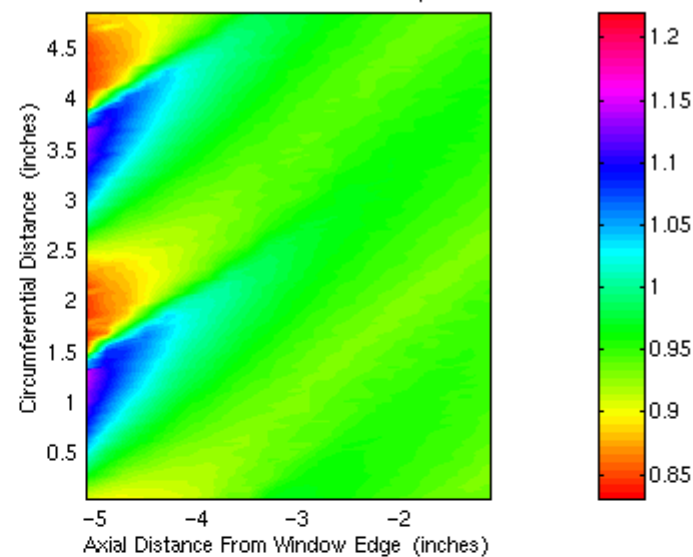


Relative Mach Number 13830 RPMC Tip Mrel =1.19

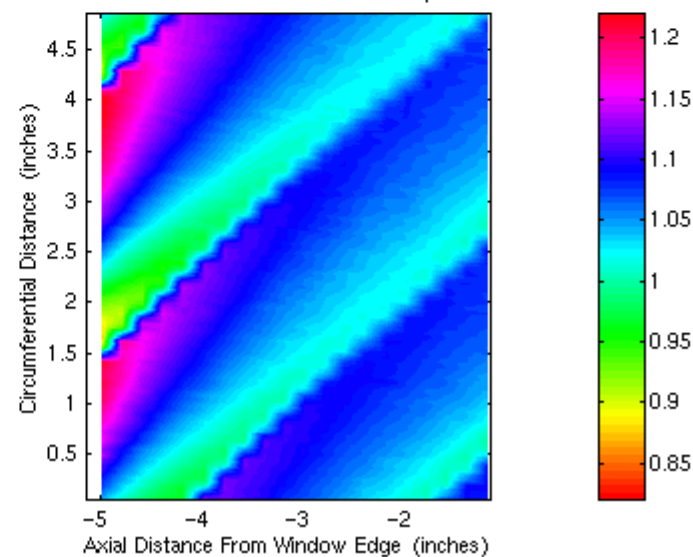


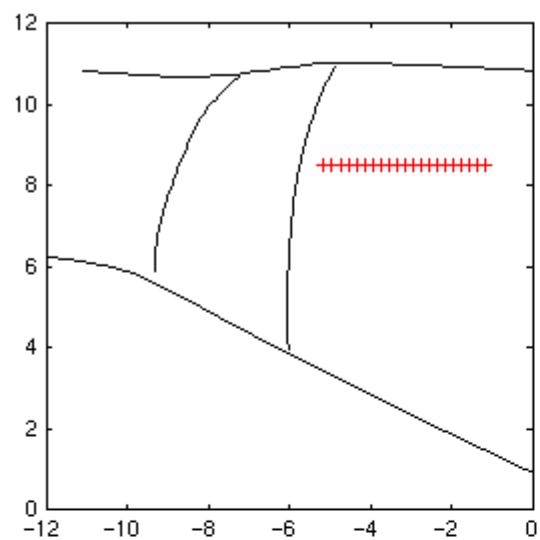


Relative Mach Number 12500 RPM Tip Mrel = 1.074

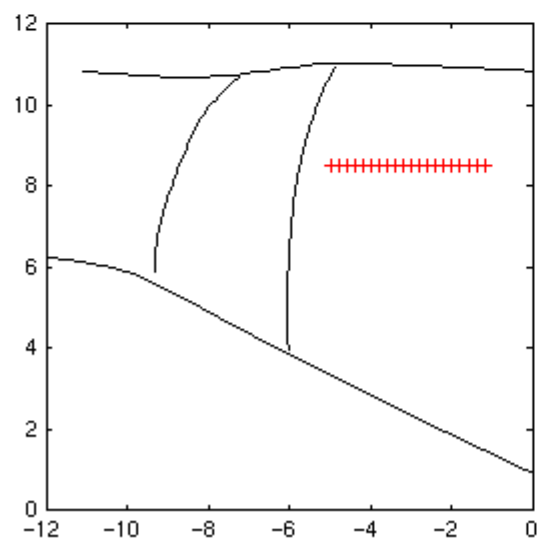
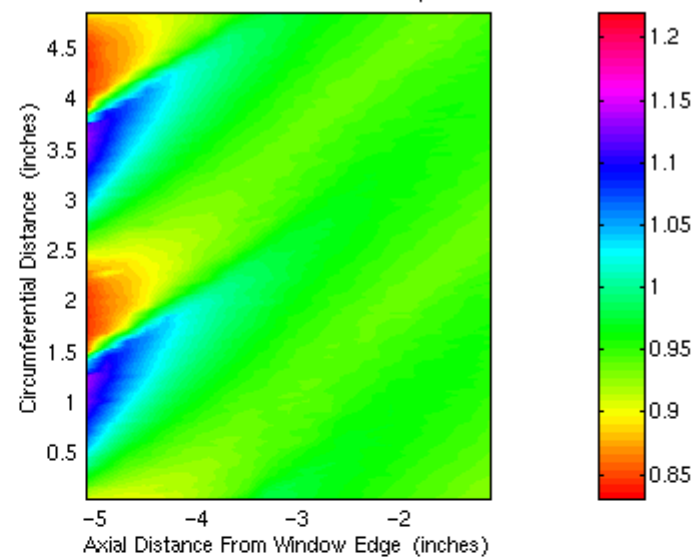


Relative Mach Number 13830 RPM Tip Mrel = 1.19

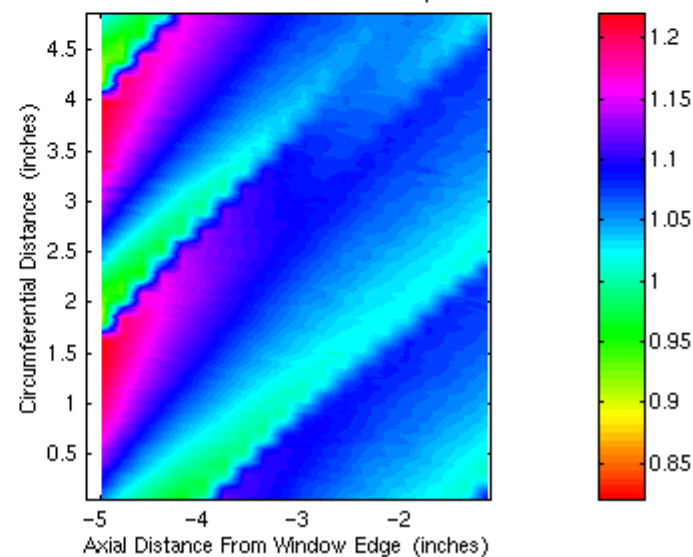


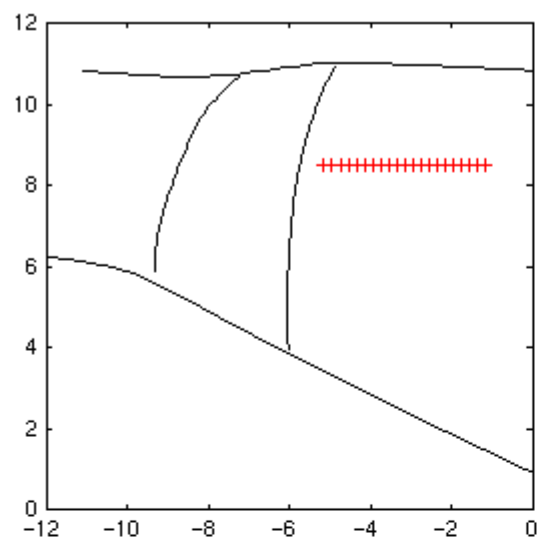


Relative Mach Number 12500 RPM Tip Mrel = 1.074

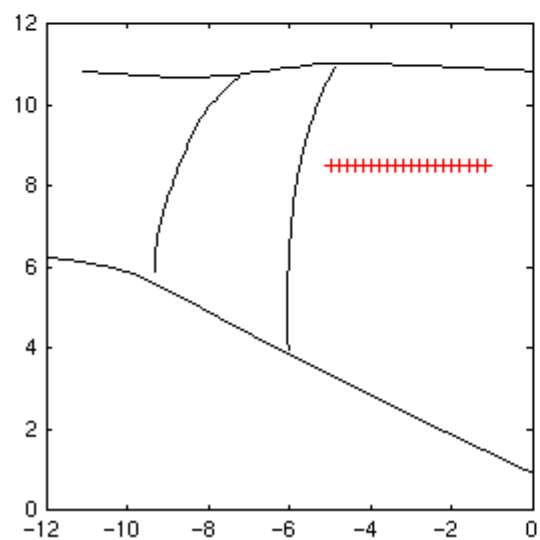
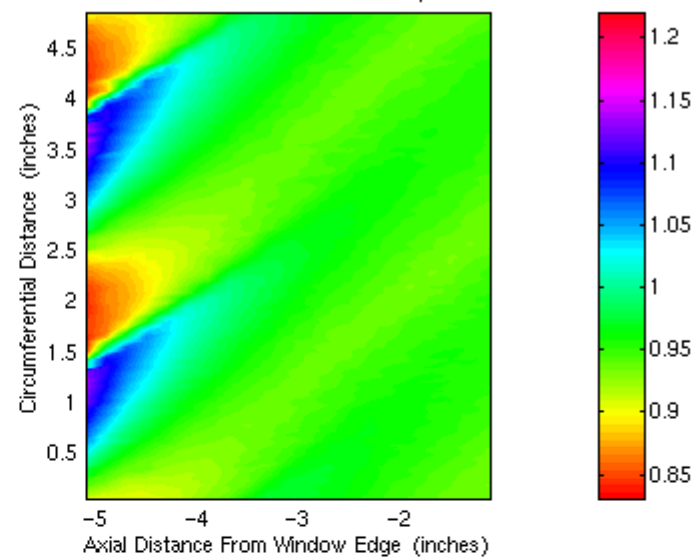


Relative Mach Number 13830 RPM Tip Mrel = 1.19

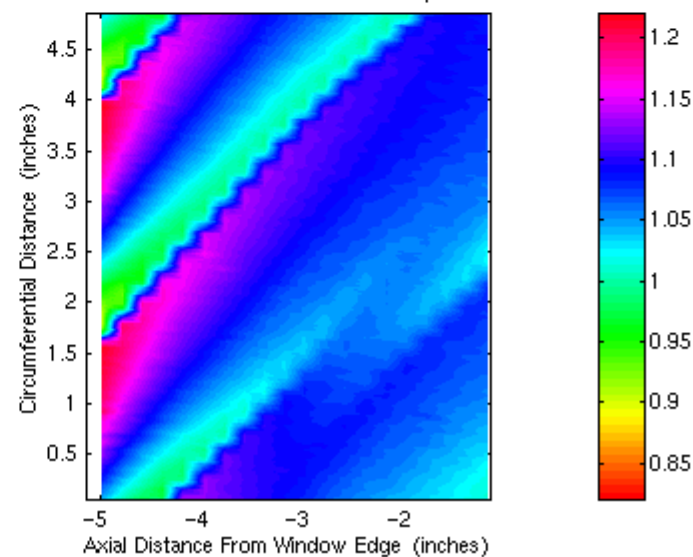


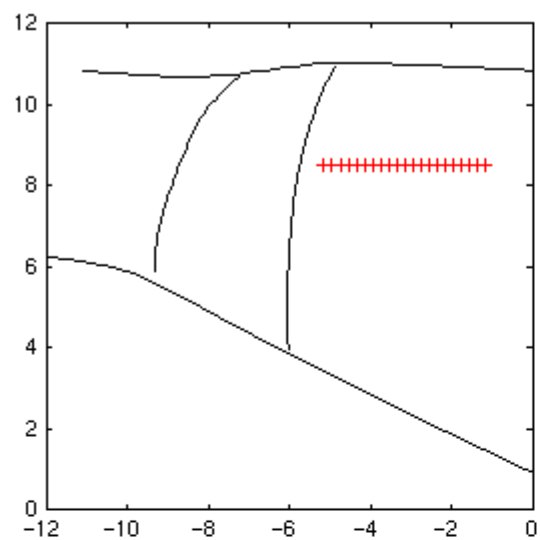


Relative Mach Number 12500 RPMC Tip Mrel =1.074

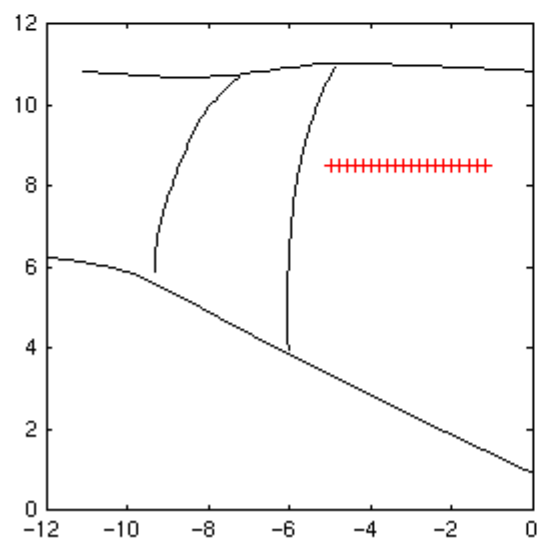
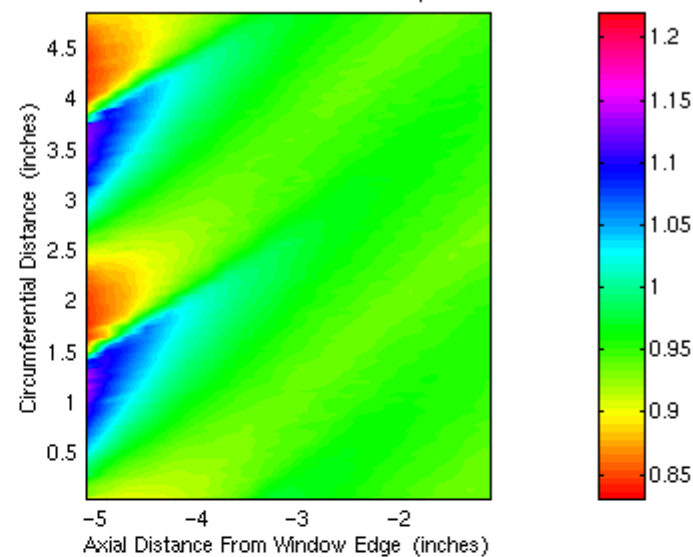


Relative Mach Number 13830 RPMC Tip Mrel =1.19

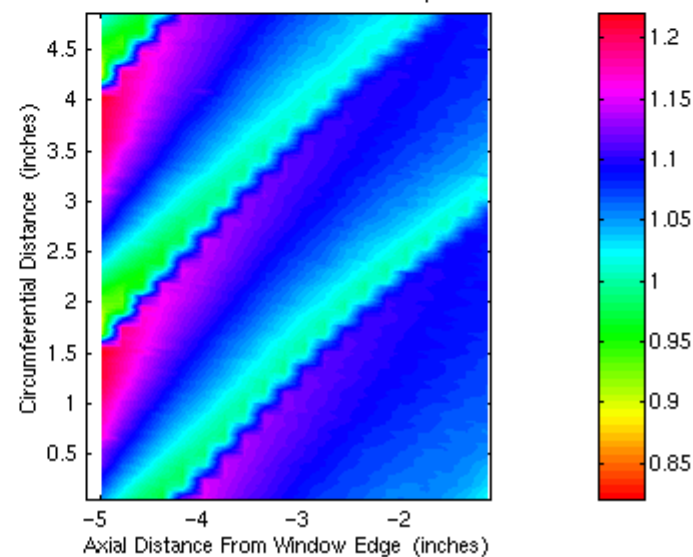


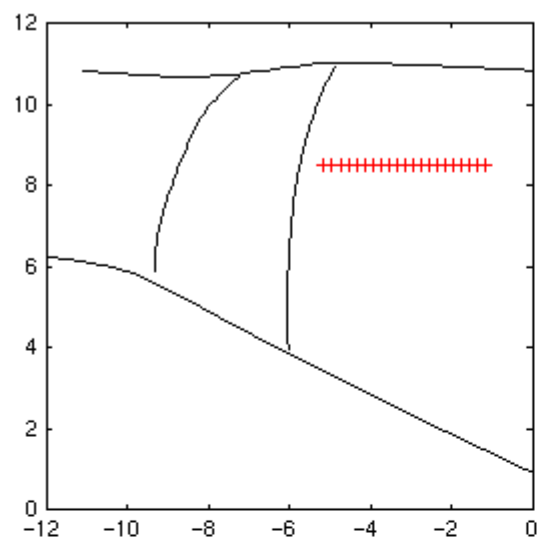


Relative Mach Number 12500 RPMC Tip Mrel =1.074

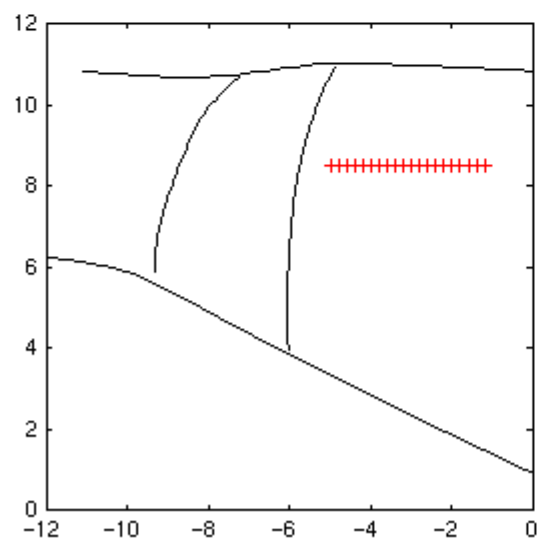
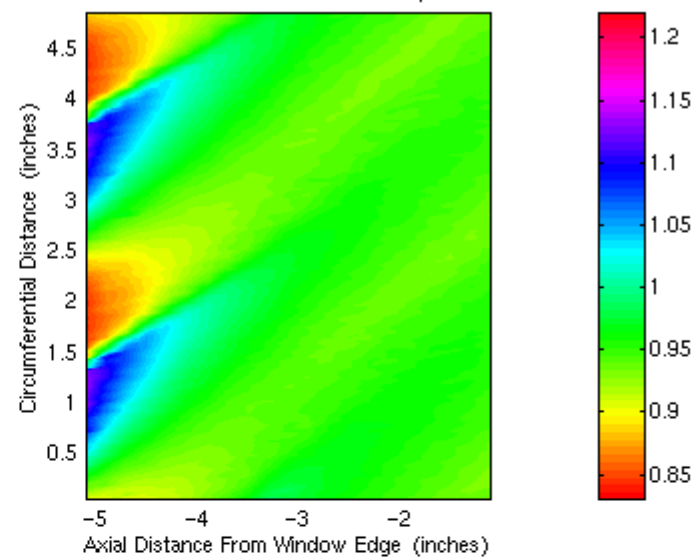


Relative Mach Number 13830 RPMC Tip Mrel =1.19

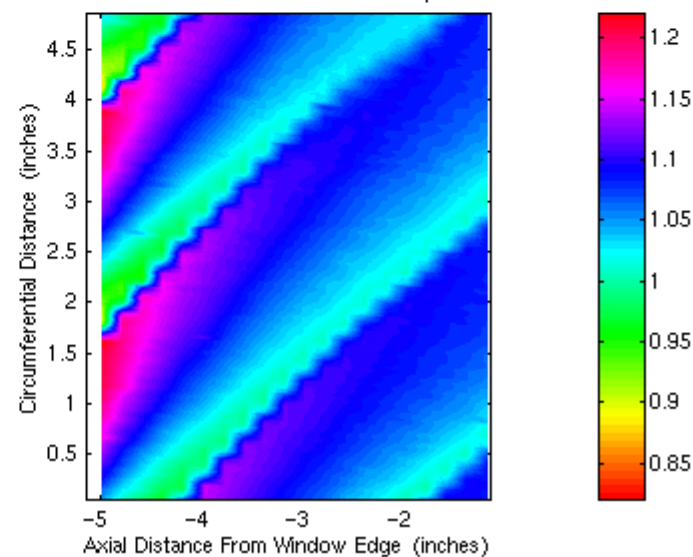


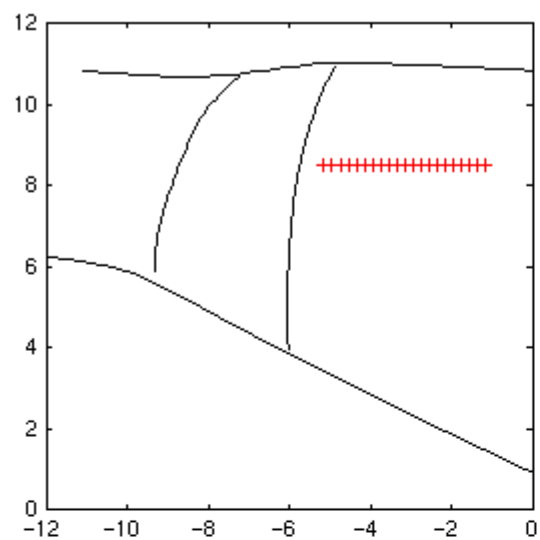


Relative Mach Number 12500 RPMC Tip Mrel =1.074

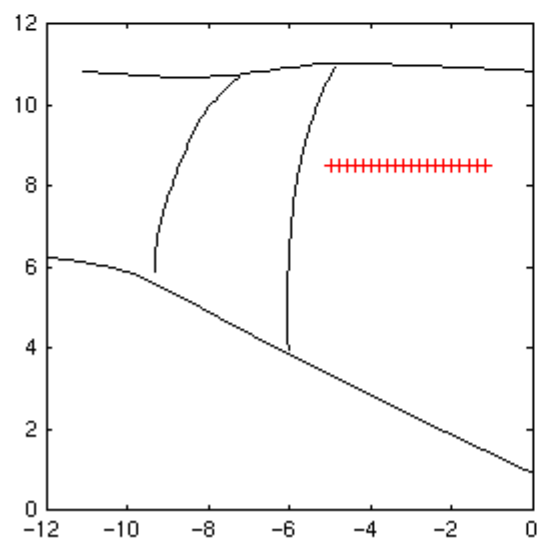
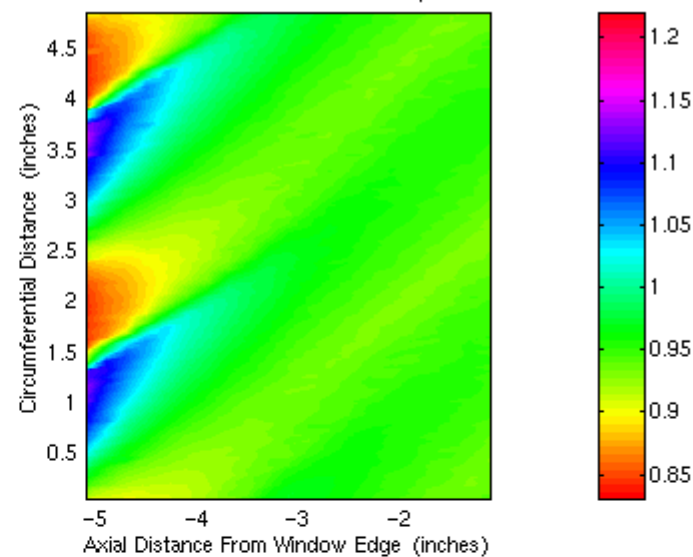


Relative Mach Number 13830 RPMC Tip Mrel =1.19

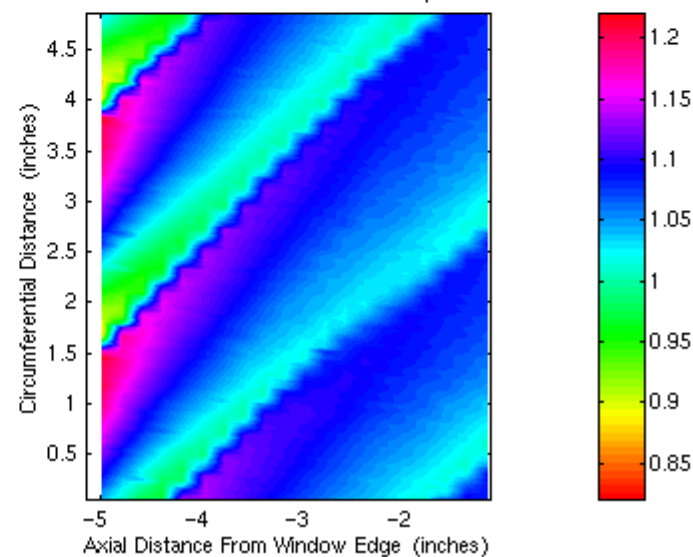


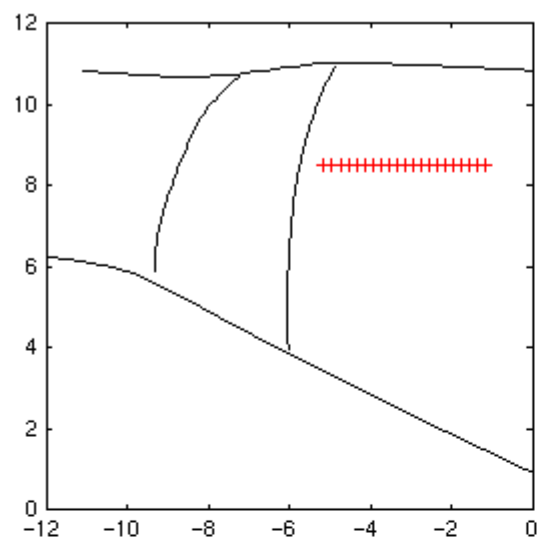


Relative Mach Number 12500 RPM Tip Mrel = 1.074

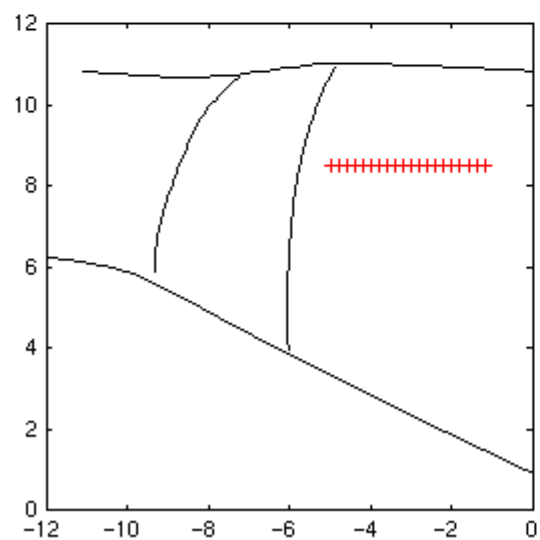
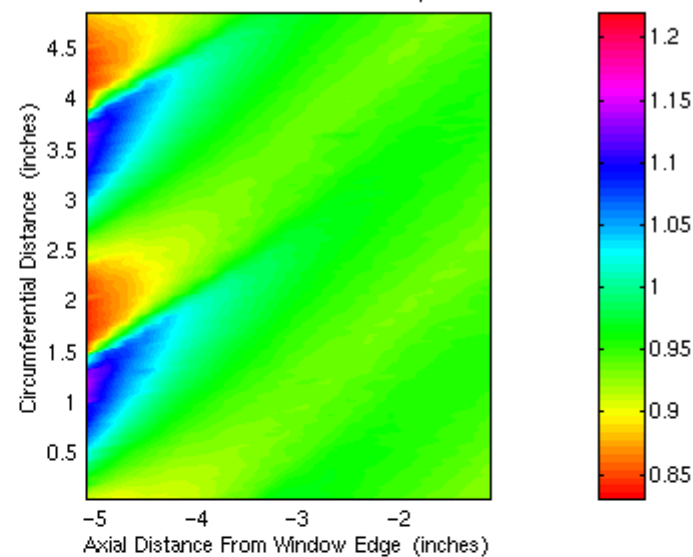


Relative Mach Number 13830 RPM Tip Mrel = 1.19





Relative Mach Number 12500 RPMC Tip Mrel =1.074



Relative Mach Number 13830 RPMC Tip Mrel =1.19

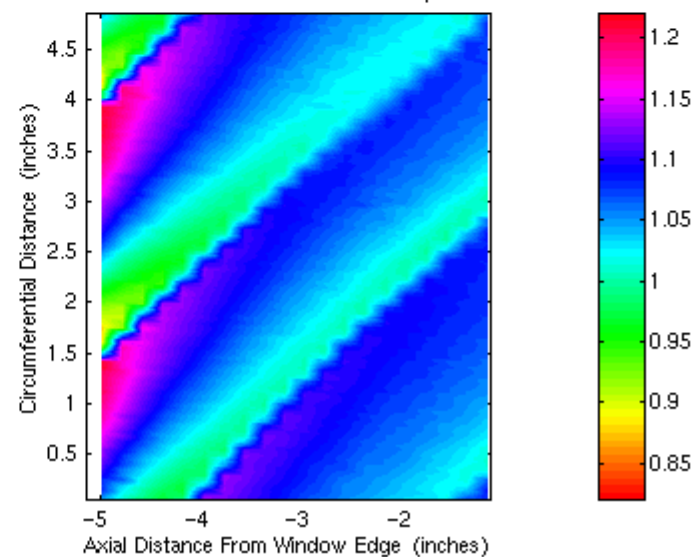
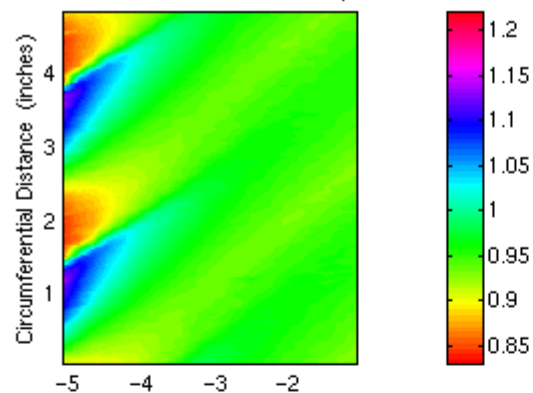
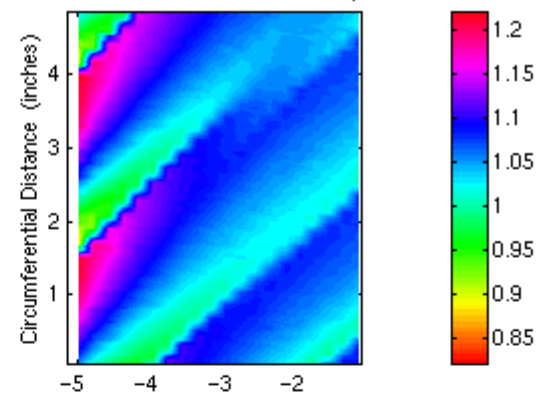


Figure 17.—Slideshow (21 slides) illustrating how the perturbation in the flow measured upstream of the forward-swept fan at $r = 8.5$ in. varies with axial location when the rotor is operated at the mid and high-speed operating conditions. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows autospectra computed from the relative Mach number distributions ($m = 22$ corresponds to the blade passing frequency). The solid lines overlaid on top of the color contour plots show the axial locations at which the data presented on that slide were acquired.

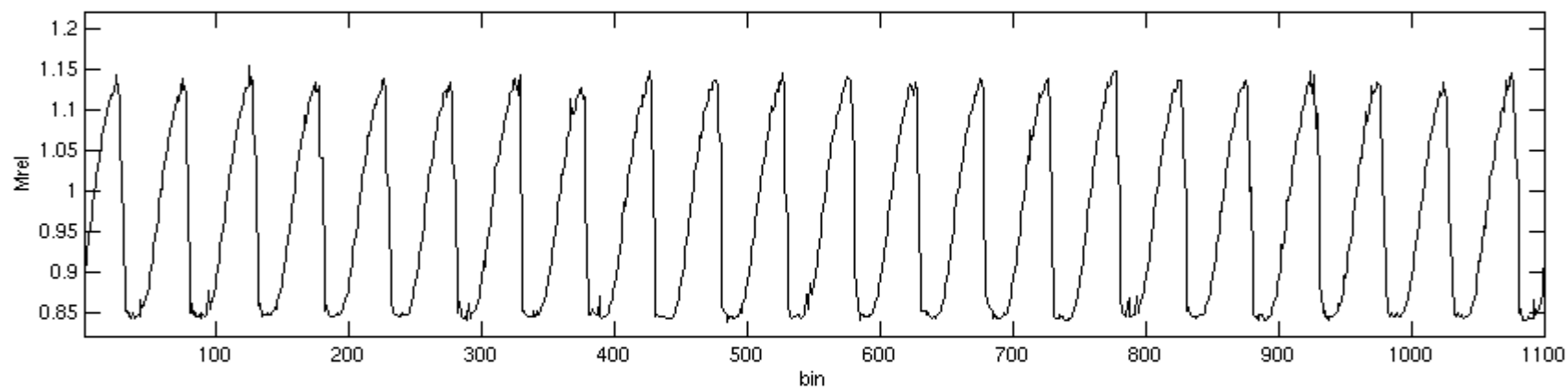
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



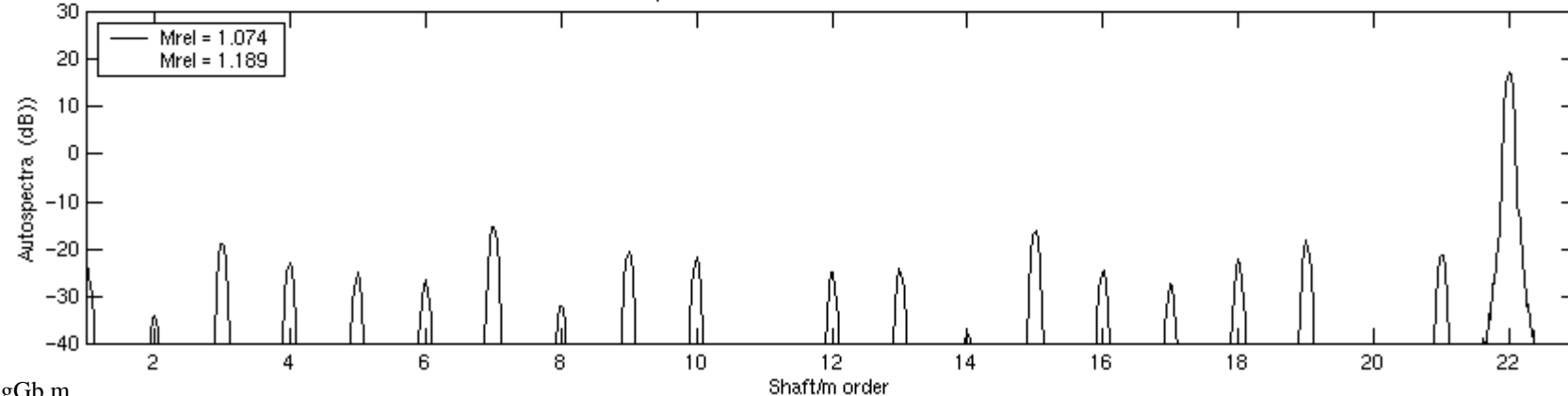
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



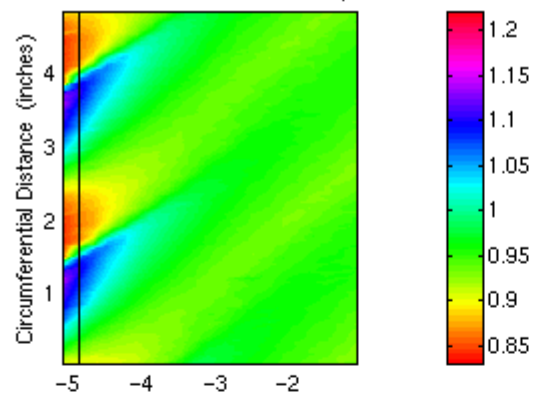
Relative Mach Number Distribution Across Rotor Rev



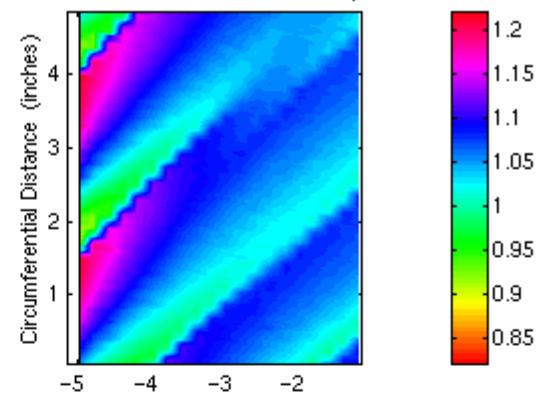
Autospectra of Relative Mach Number Distributions



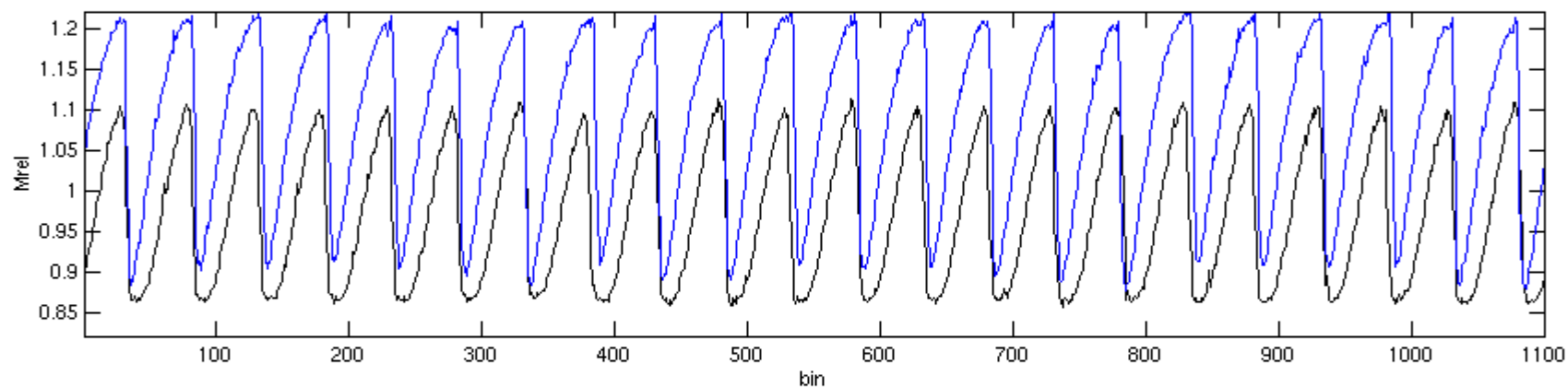
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



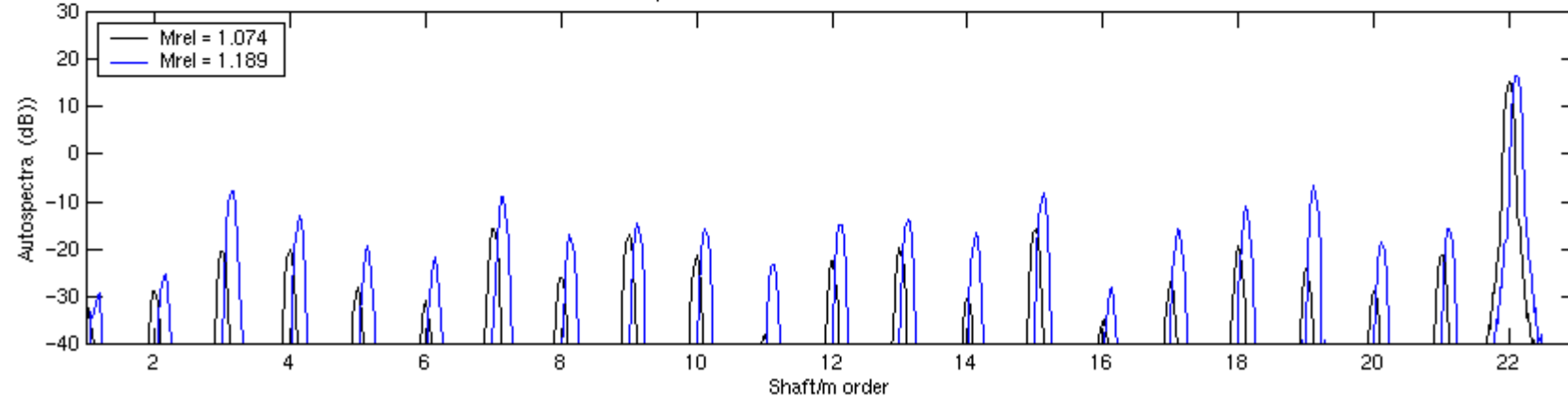
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



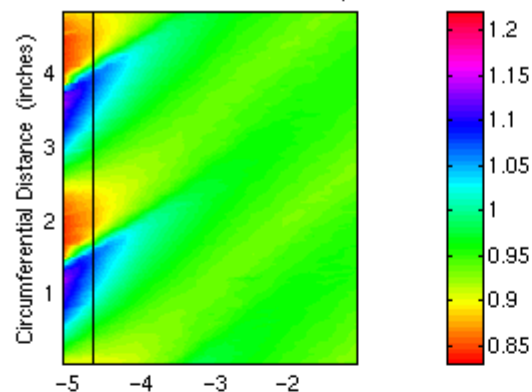
Relative Mach Number Distribution Across Rotor Rev



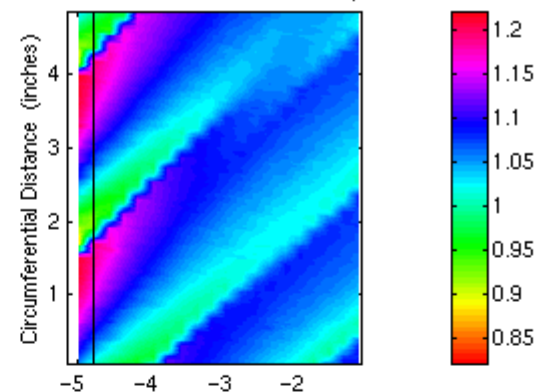
Autospectra of Relative Mach Number Distributions



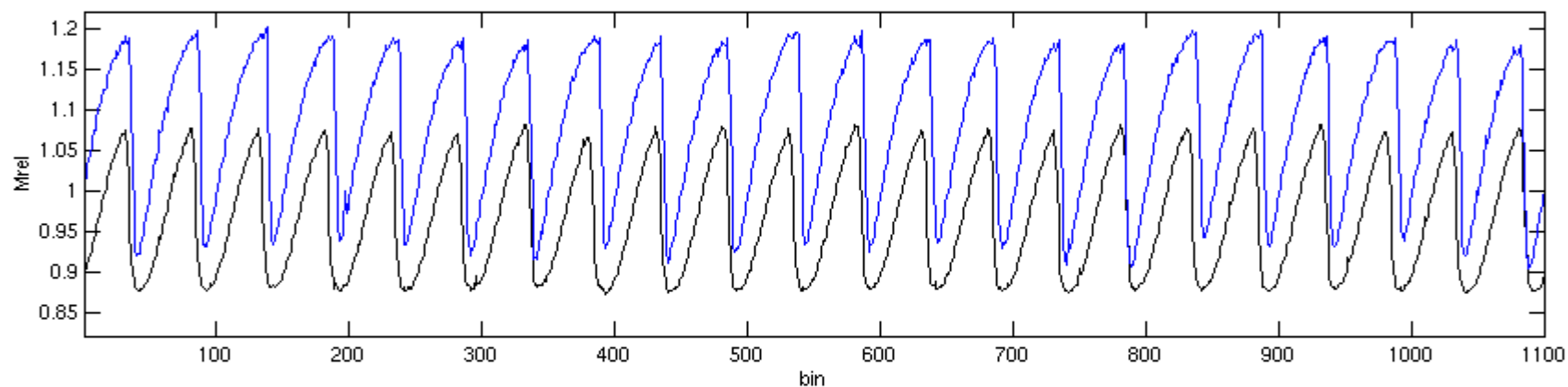
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



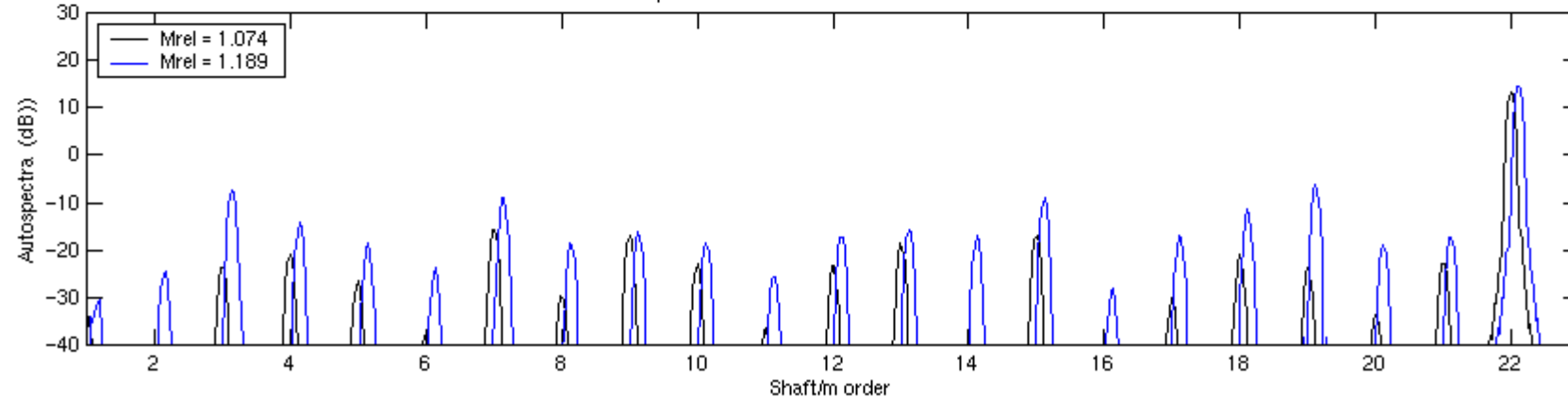
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



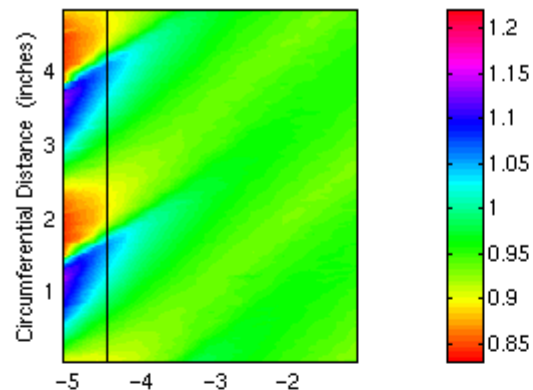
Relative Mach Number Distribution Across Rotor Rev



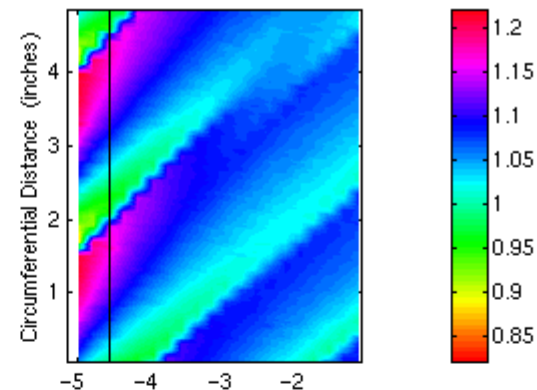
Autospectra of Relative Mach Number Distributions



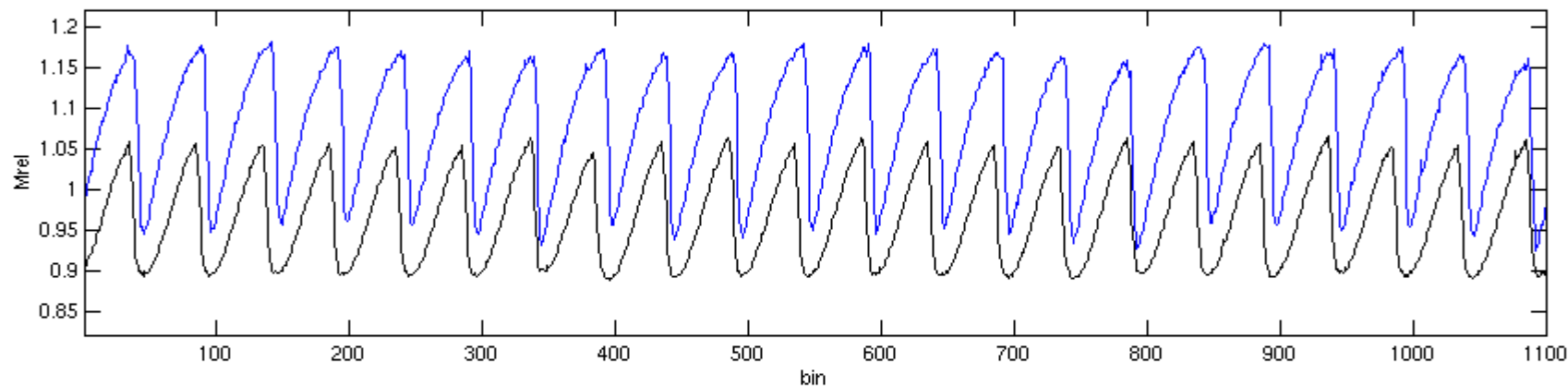
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



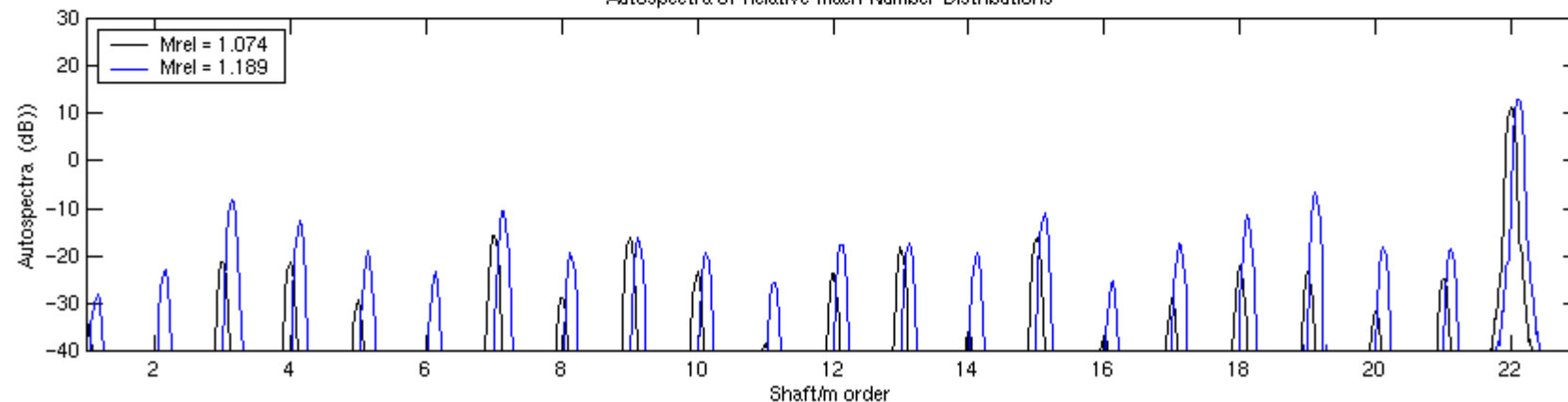
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



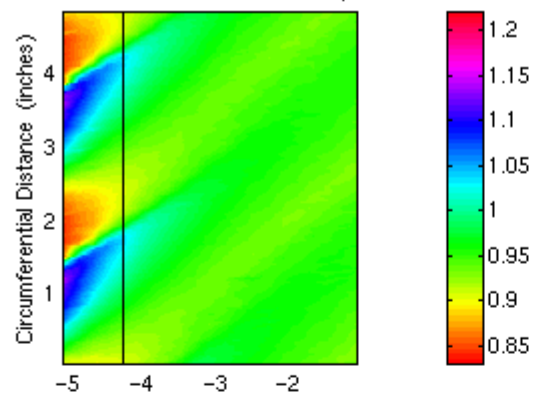
Relative Mach Number Distribution Across Rotor Rev



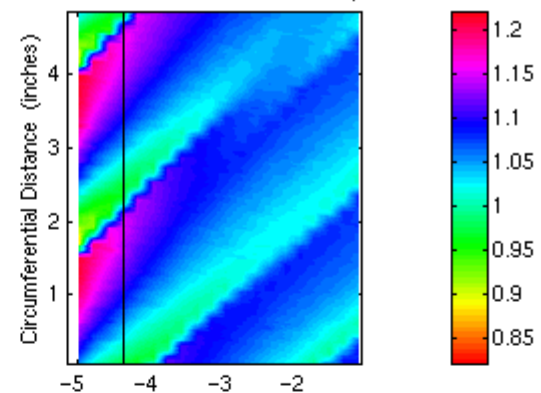
Autospectra of Relative Mach Number Distributions



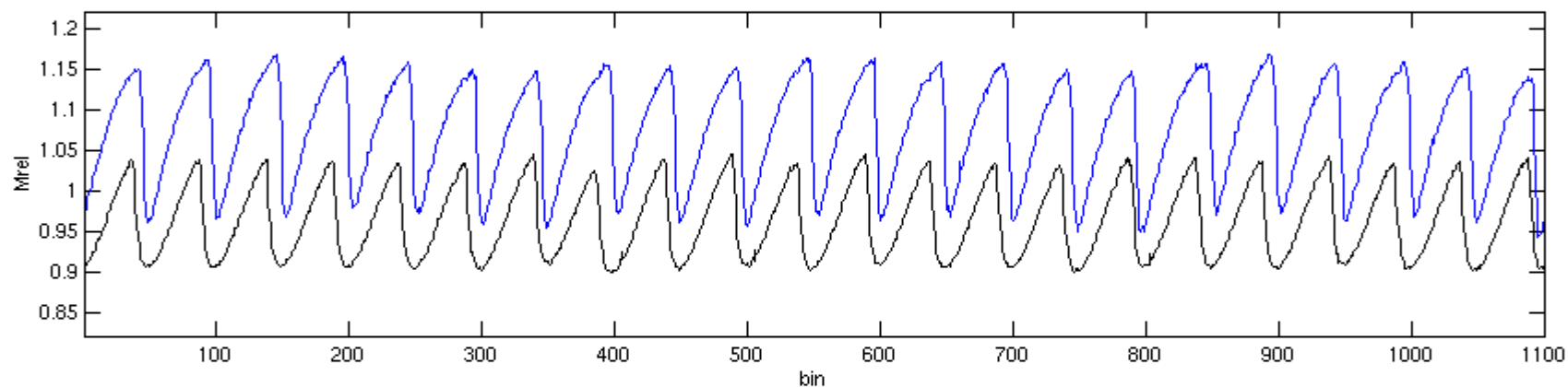
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



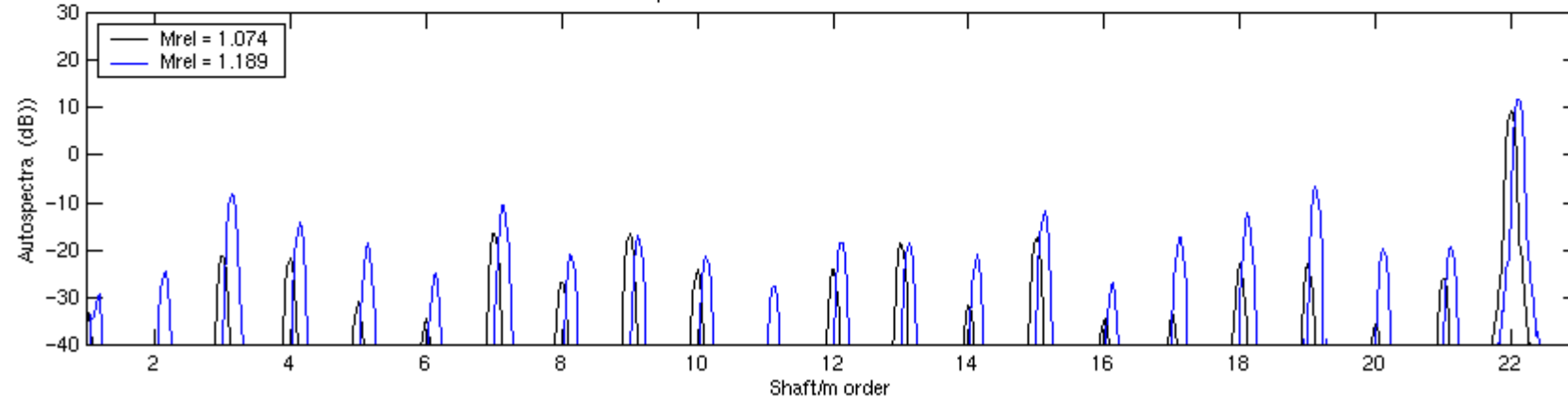
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



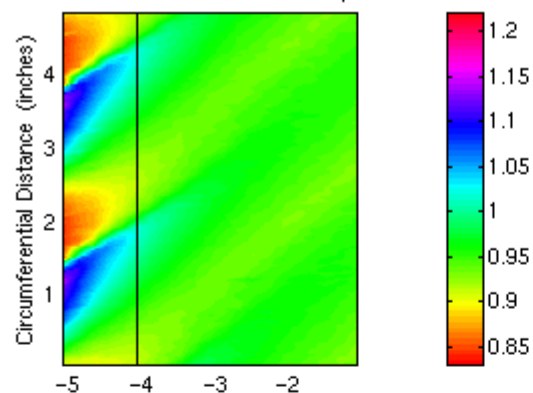
Relative Mach Number Distribution Across Rotor Rev



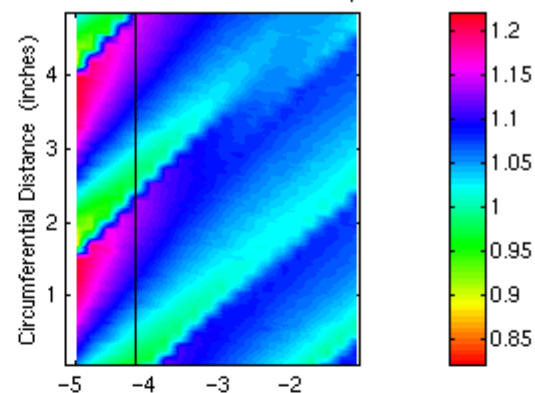
Autospectra of Relative Mach Number Distributions



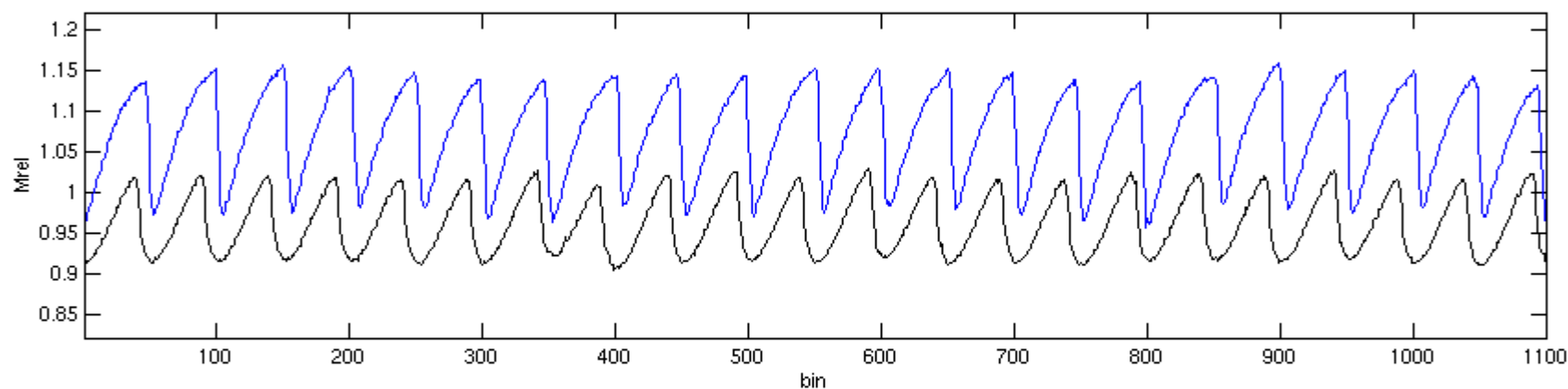
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



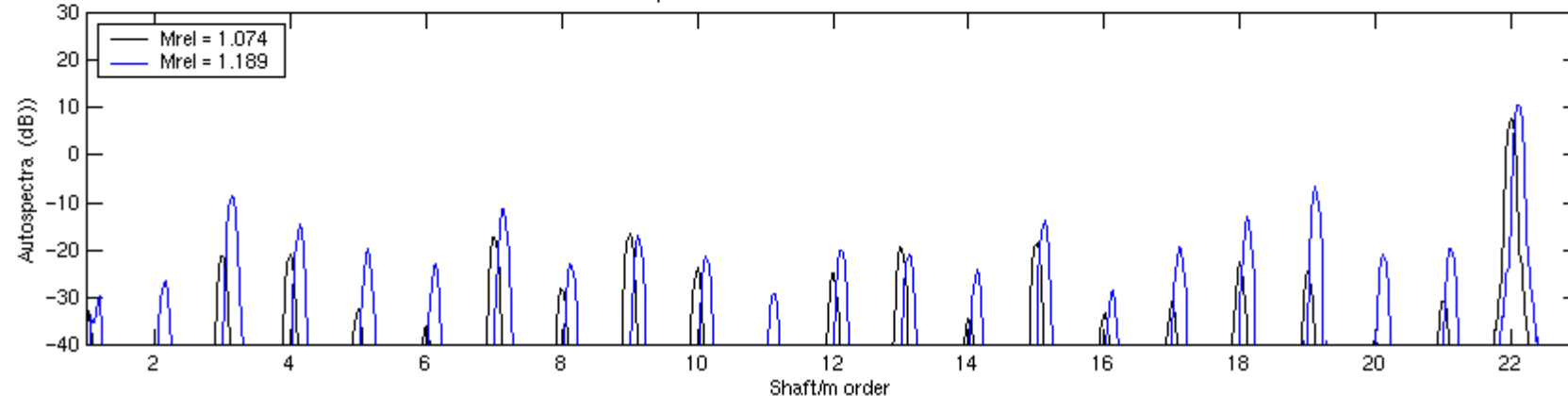
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



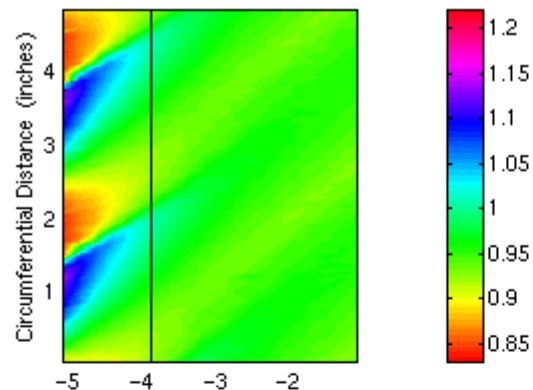
Relative Mach Number Distribution Across Rotor Rev



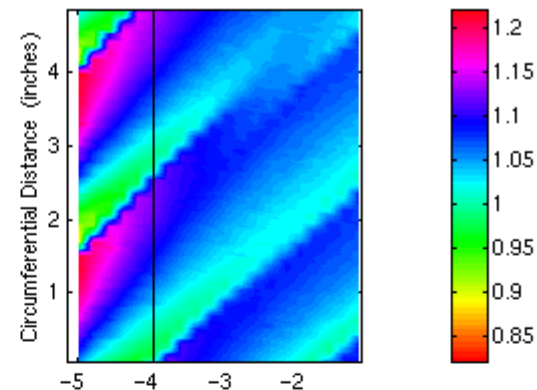
Autospectra of Relative Mach Number Distributions



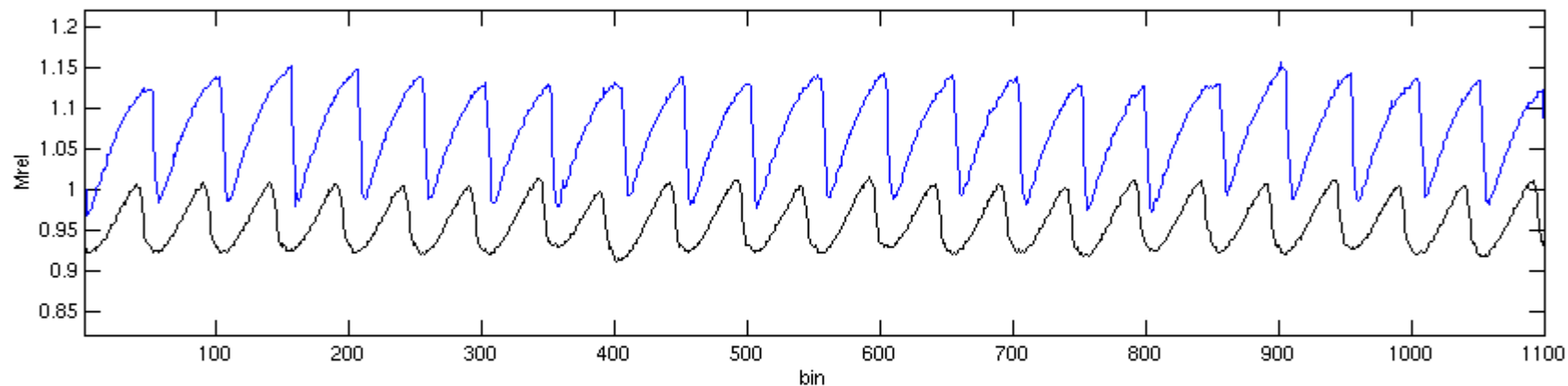
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



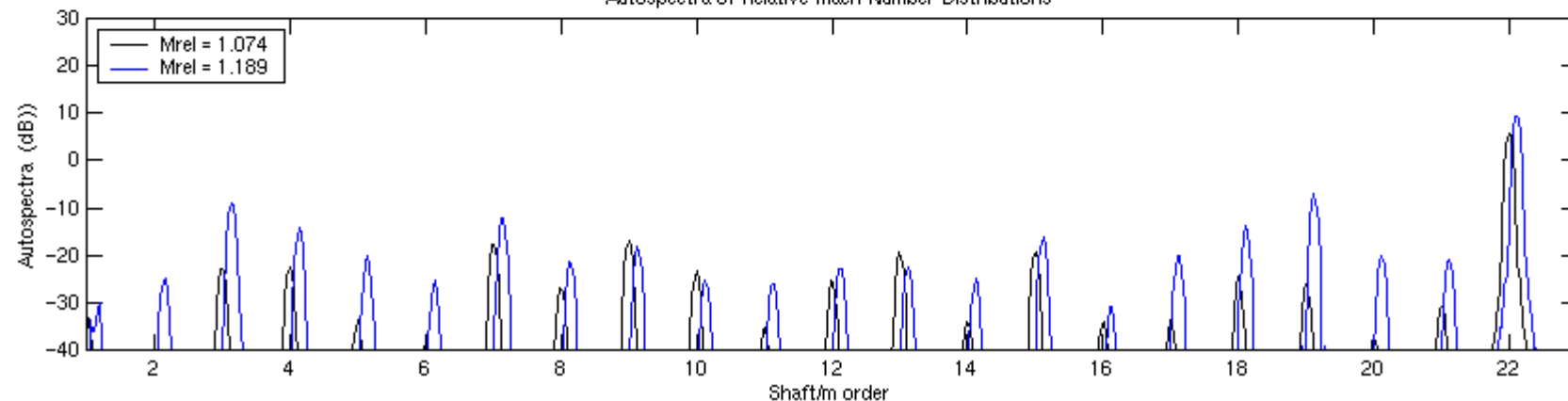
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



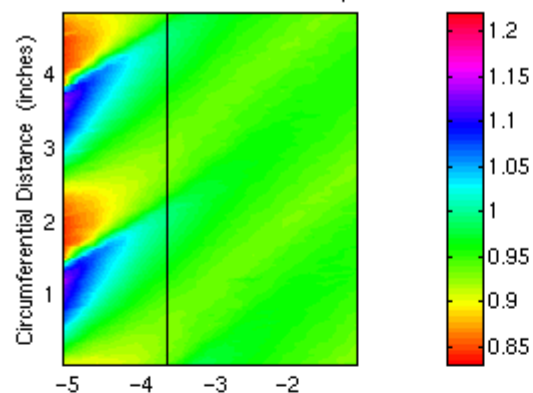
Relative Mach Number Distribution Across Rotor Rev



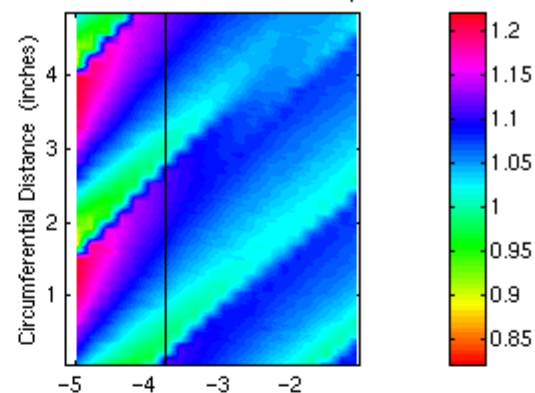
Autospectra of Relative Mach Number Distributions



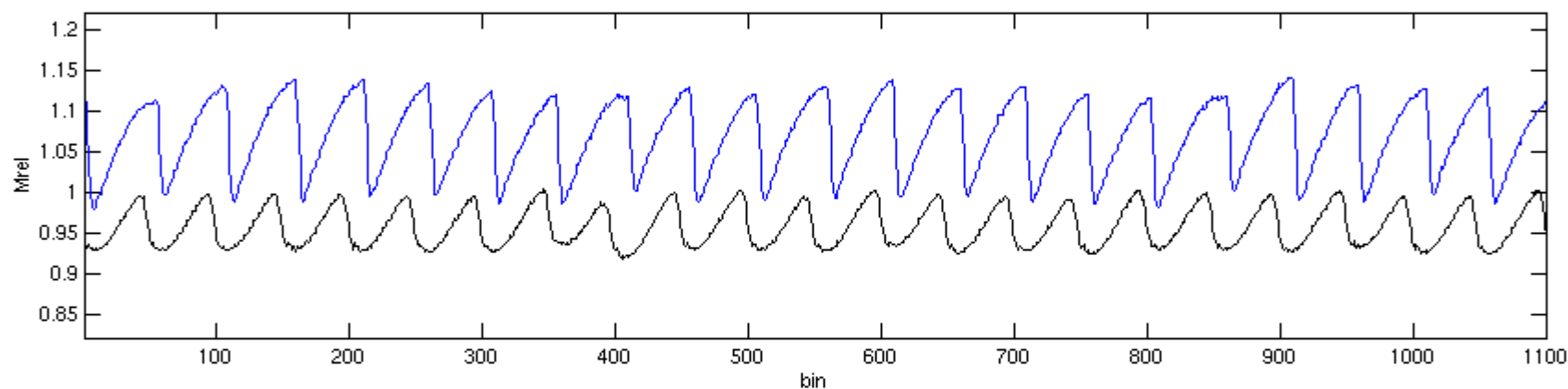
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



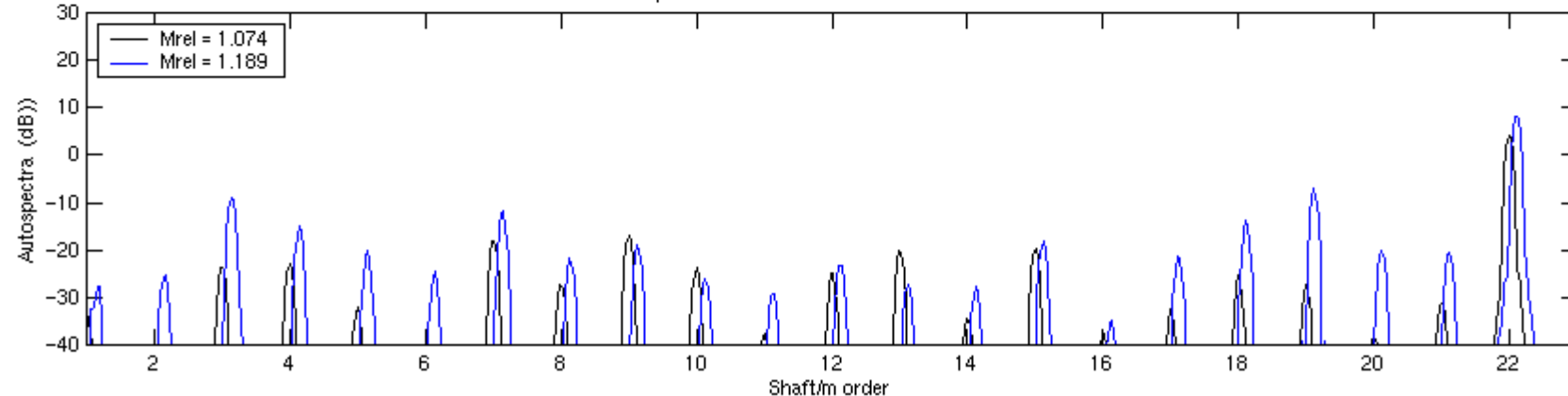
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



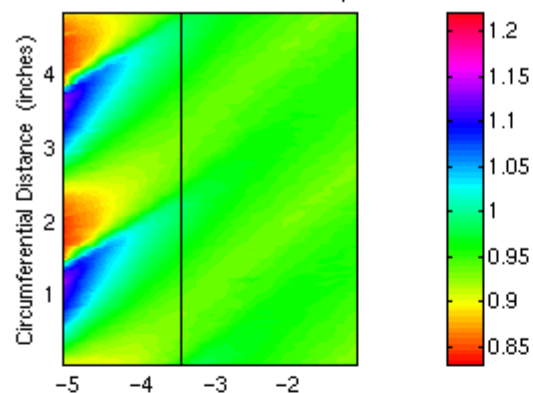
Relative Mach Number Distribution Across Rotor Rev



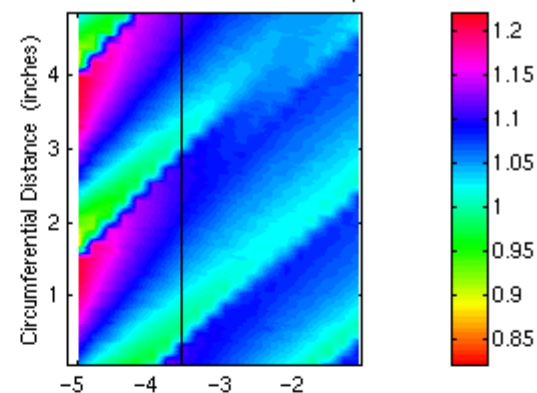
Autospectra of Relative Mach Number Distributions



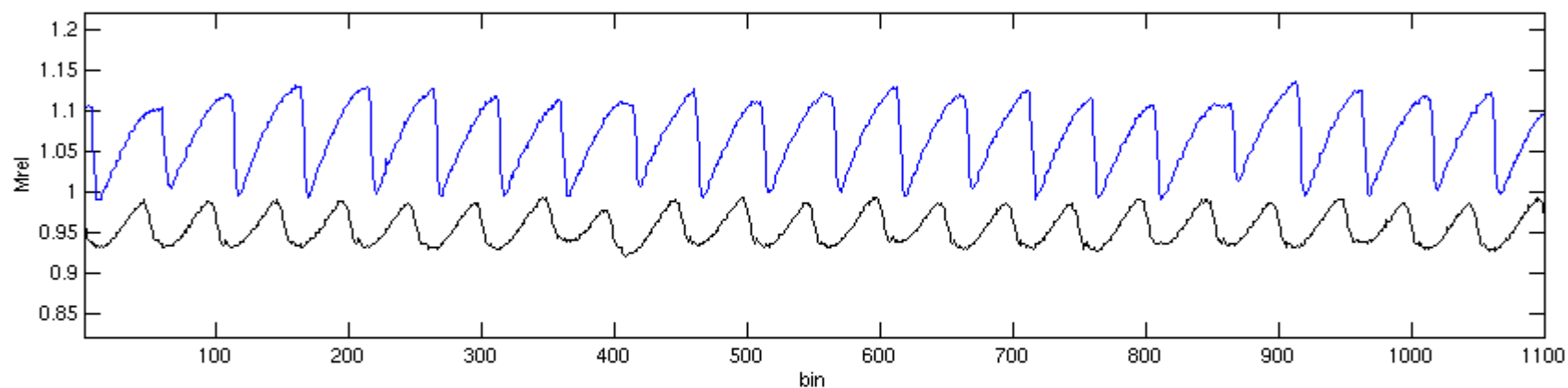
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



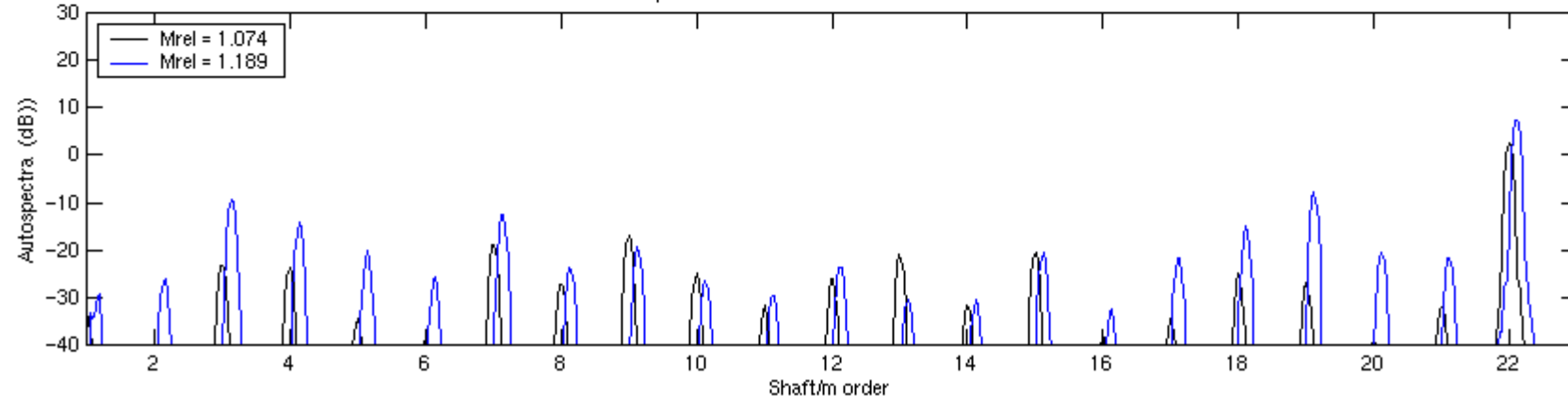
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



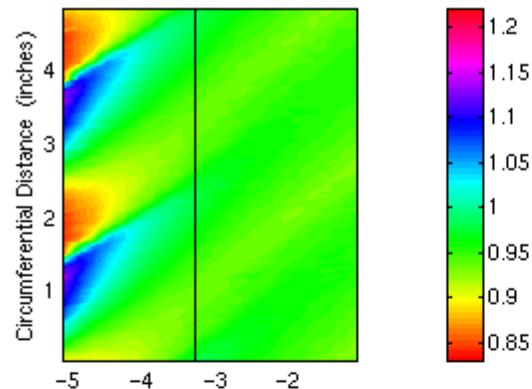
Relative Mach Number Distribution Across Rotor Rev



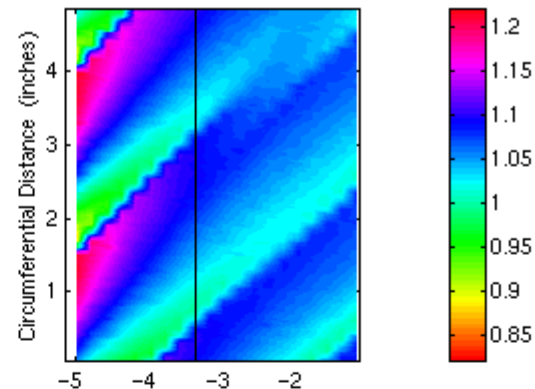
Autospectra of Relative Mach Number Distributions



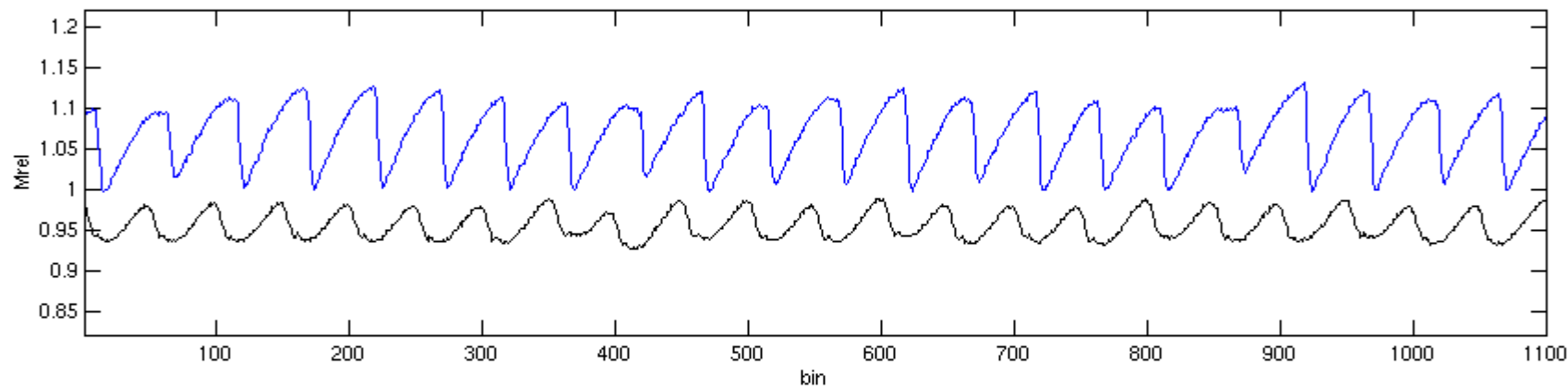
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



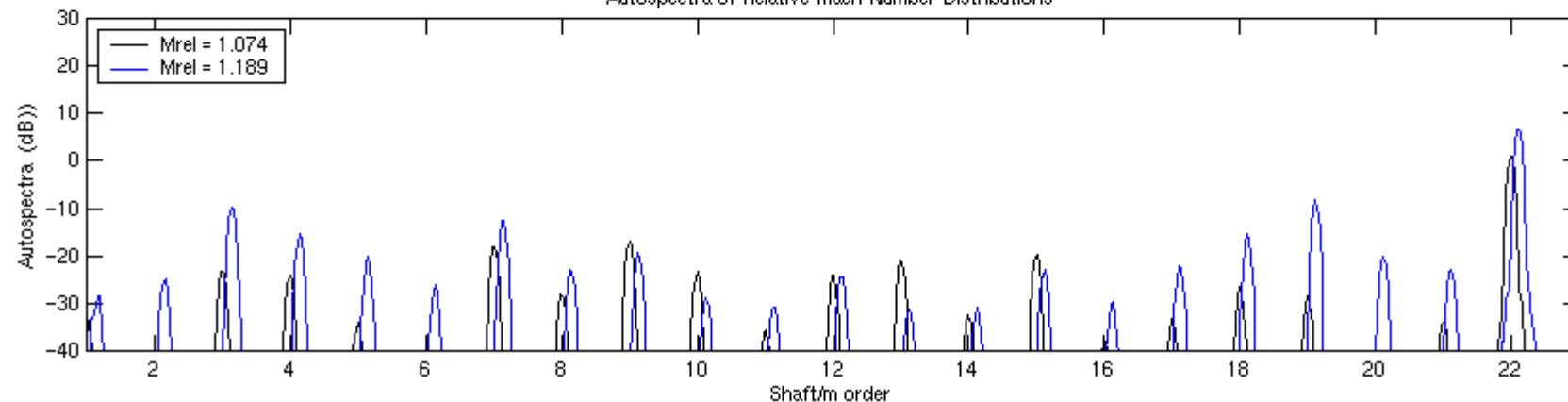
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



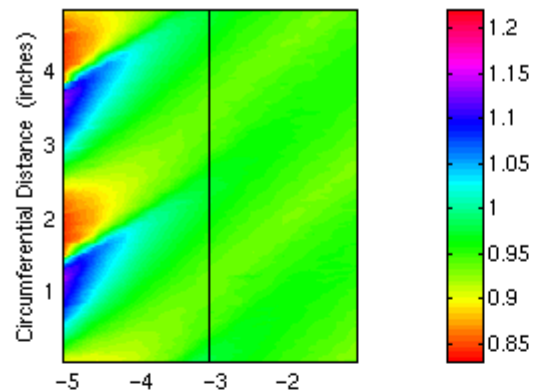
Relative Mach Number Distribution Across Rotor Rev



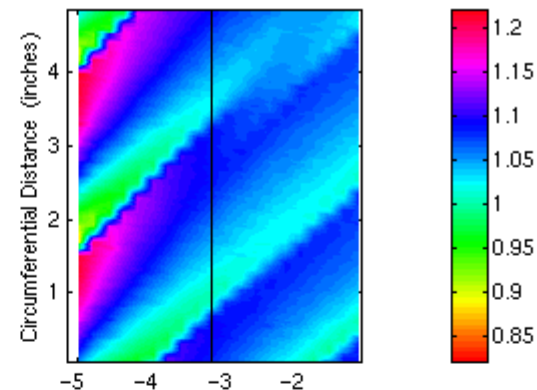
Autospectra of Relative Mach Number Distributions



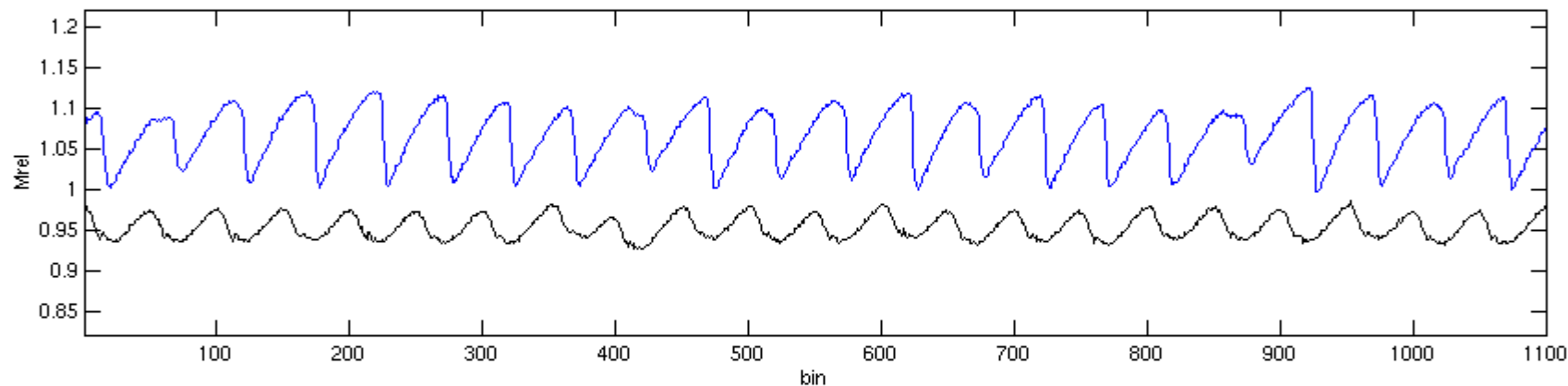
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



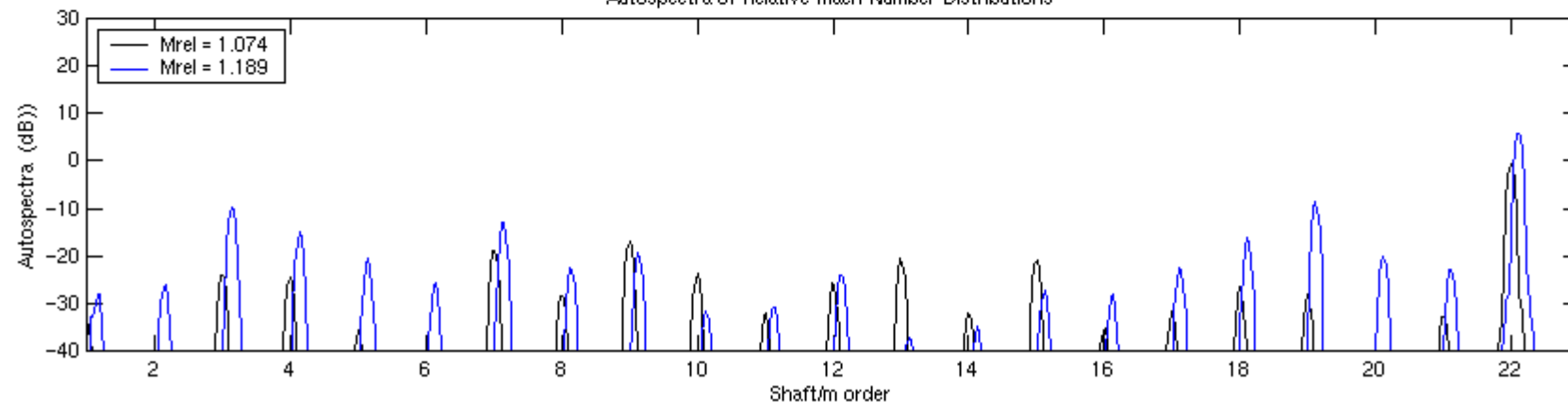
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



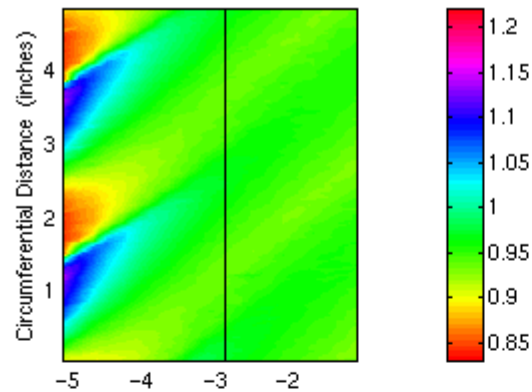
Relative Mach Number Distribution Across Rotor Rev



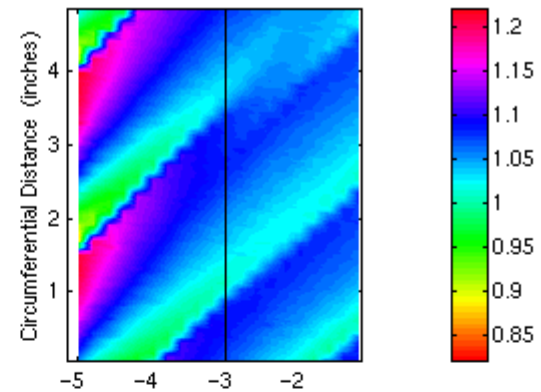
Autospectra of Relative Mach Number Distributions



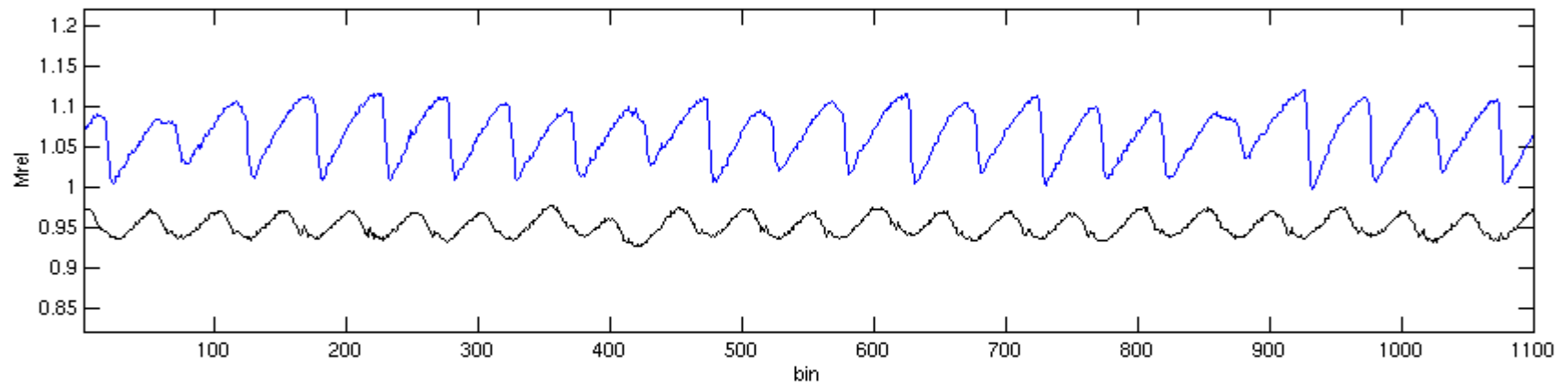
Relative Mach Number 12500 RPMC Tip Mrel =1.074



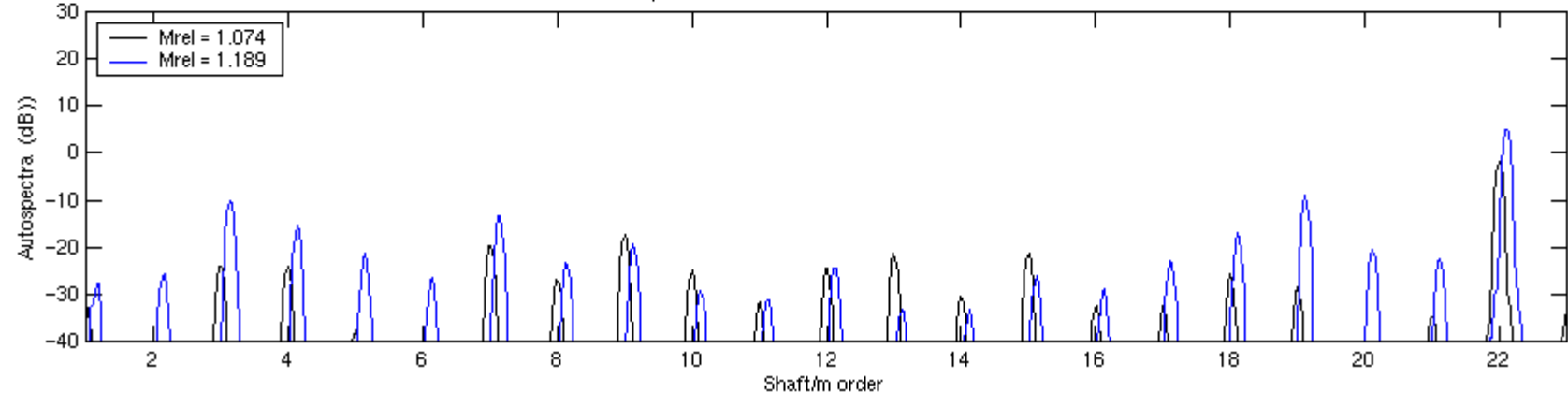
Relative Mach Number 13830 RPMC Tip Mrel =1.19



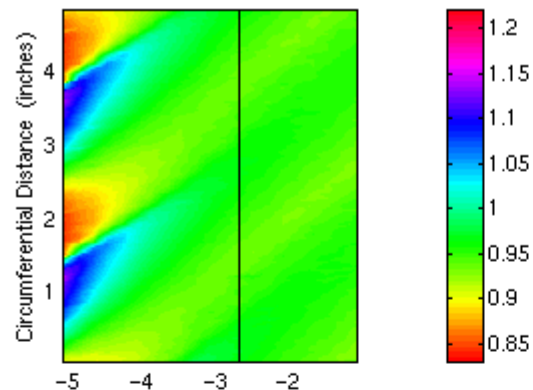
Relative Mach Number Distribution Across Rotor Rev



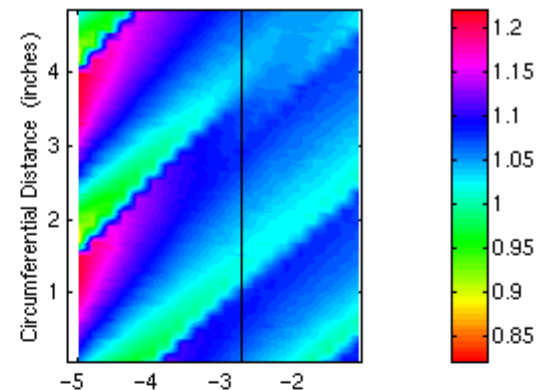
Autospectra of Relative Mach Number Distributions



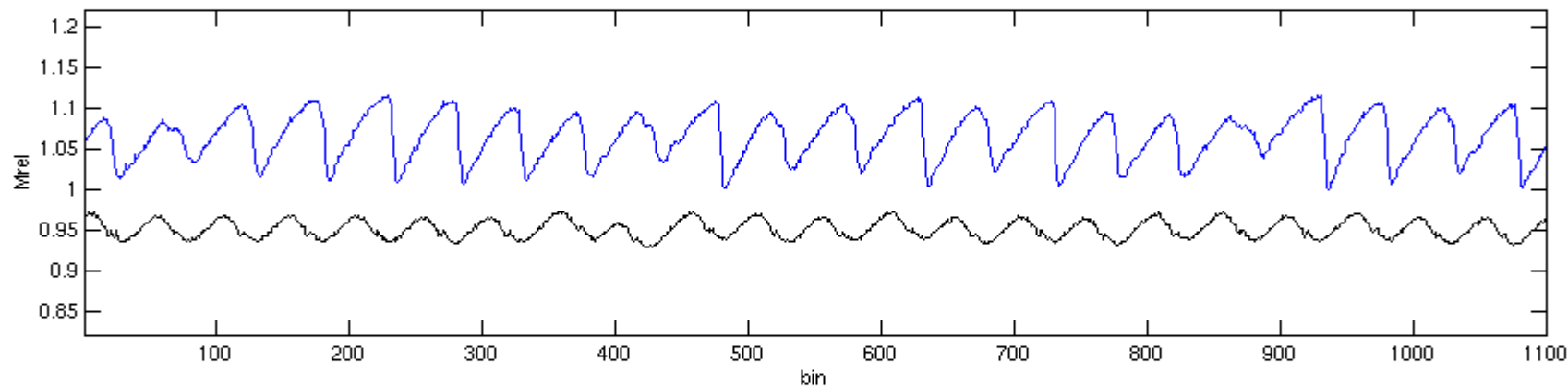
Relative Mach Number 12500 RPMC Tip Mrel =1.074



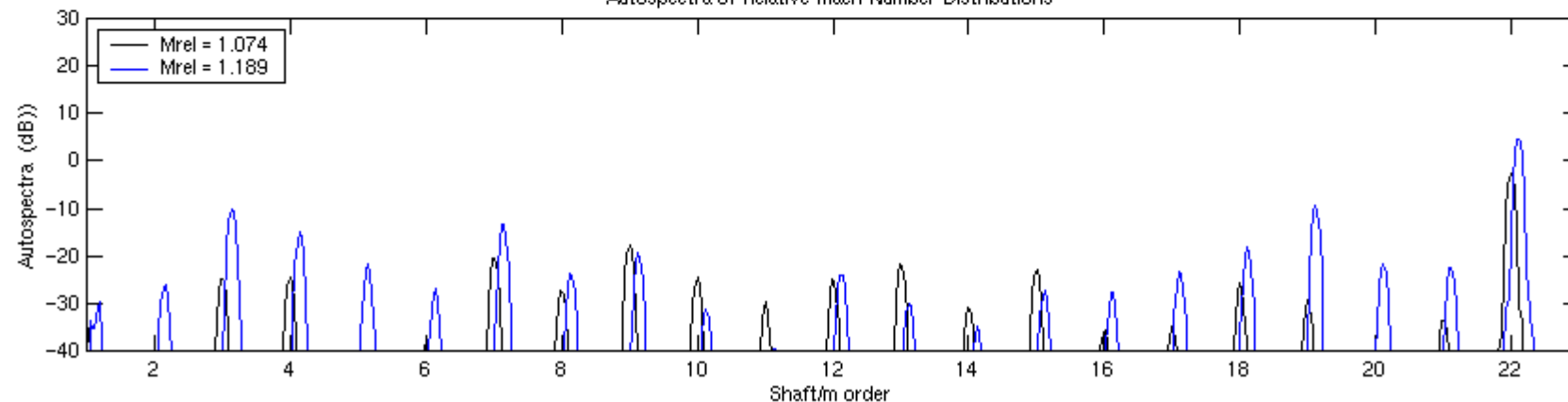
Relative Mach Number 13830 RPMC Tip Mrel =1.19



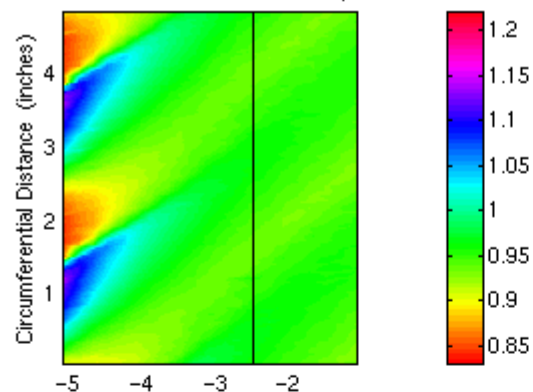
Relative Mach Number Distribution Across Rotor Rev



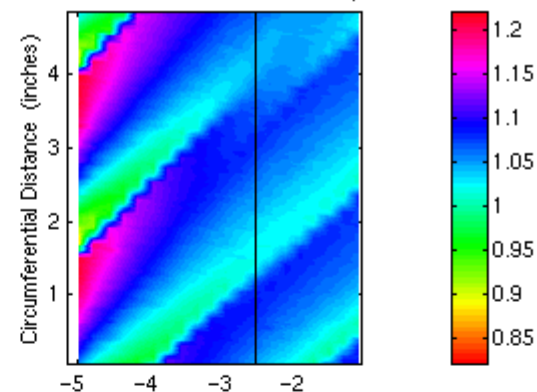
Autospectra of Relative Mach Number Distributions



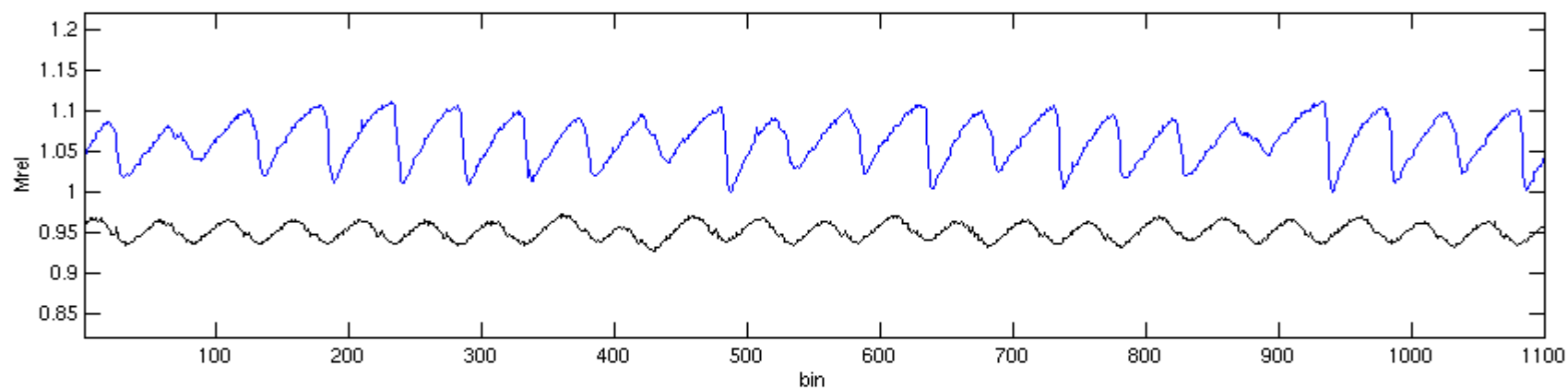
Relative Mach Number 12500 RPMC Tip Mrel =1.074



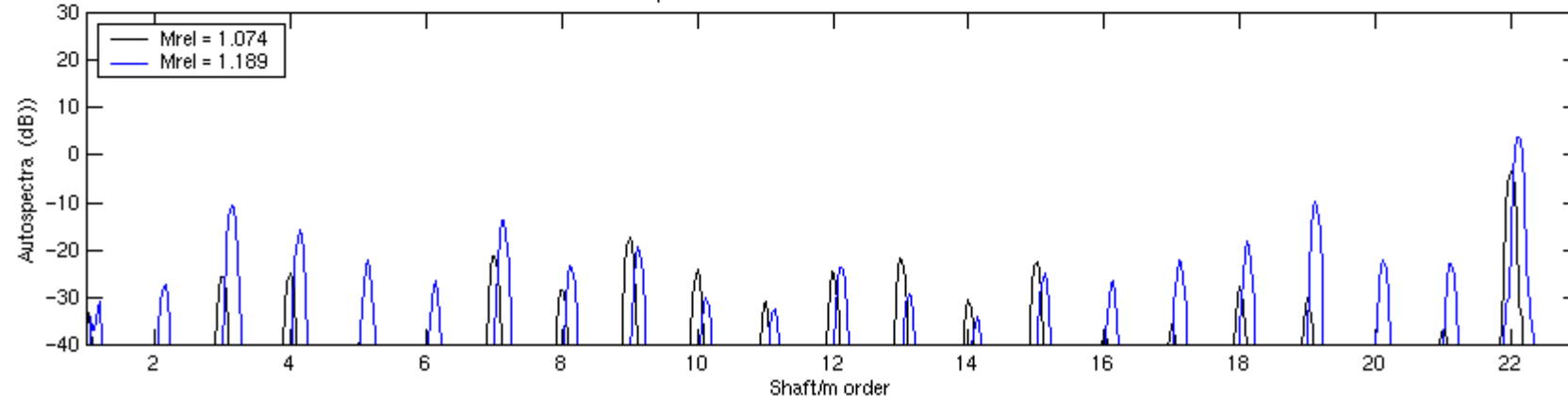
Relative Mach Number 13830 RPMC Tip Mrel =1.19



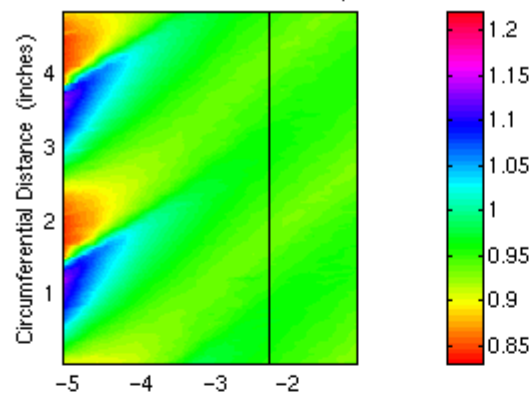
Relative Mach Number Distribution Across Rotor Rev



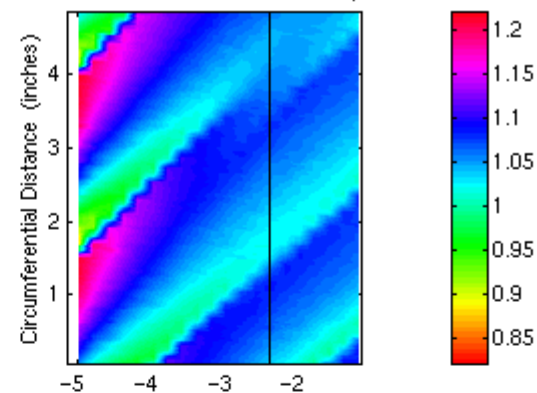
Autospectra of Relative Mach Number Distributions



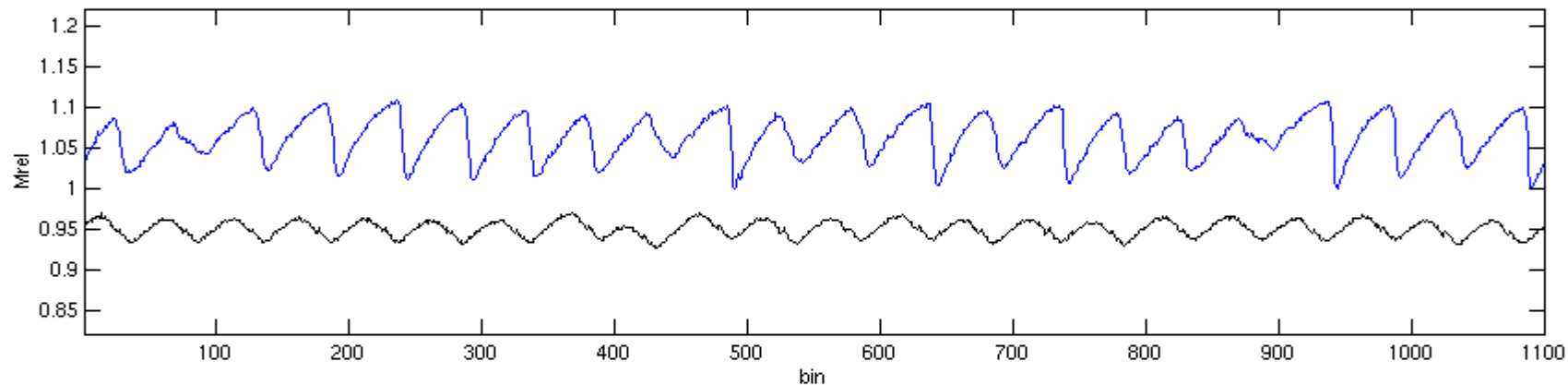
Relative Mach Number 12500 RPMC Tip Mrel =1.074



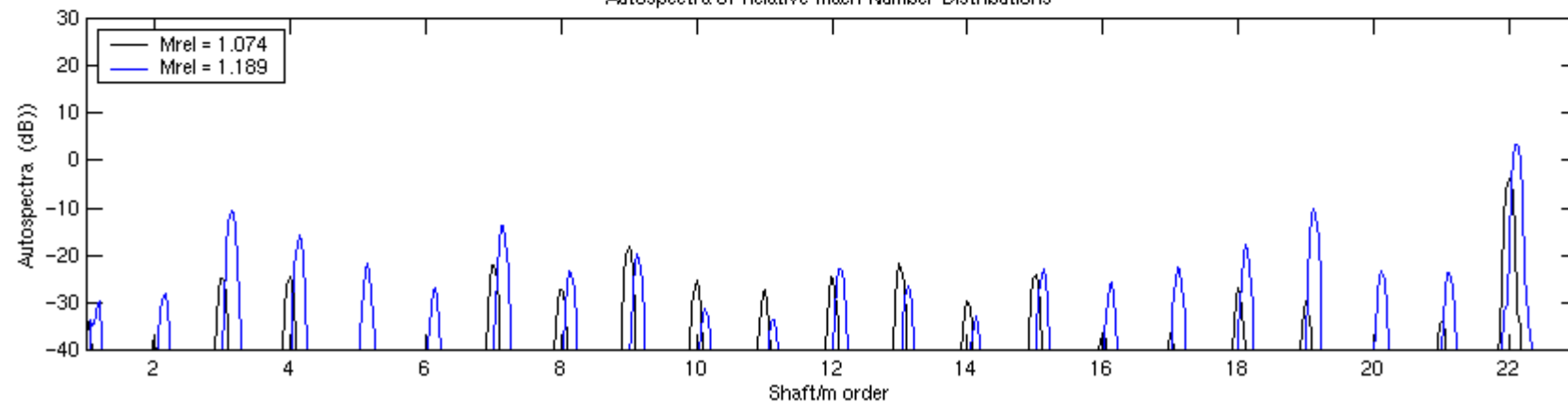
Relative Mach Number 13830 RPMC Tip Mrel =1.19



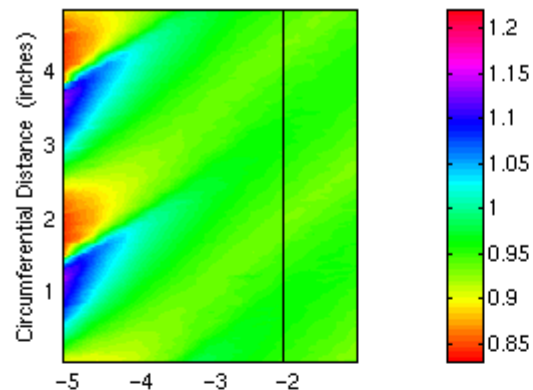
Relative Mach Number Distribution Across Rotor Rev



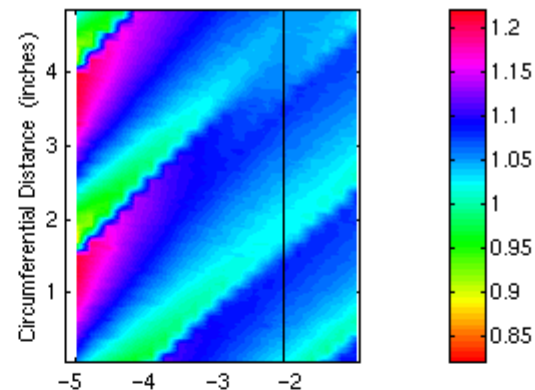
Autospectra of Relative Mach Number Distributions



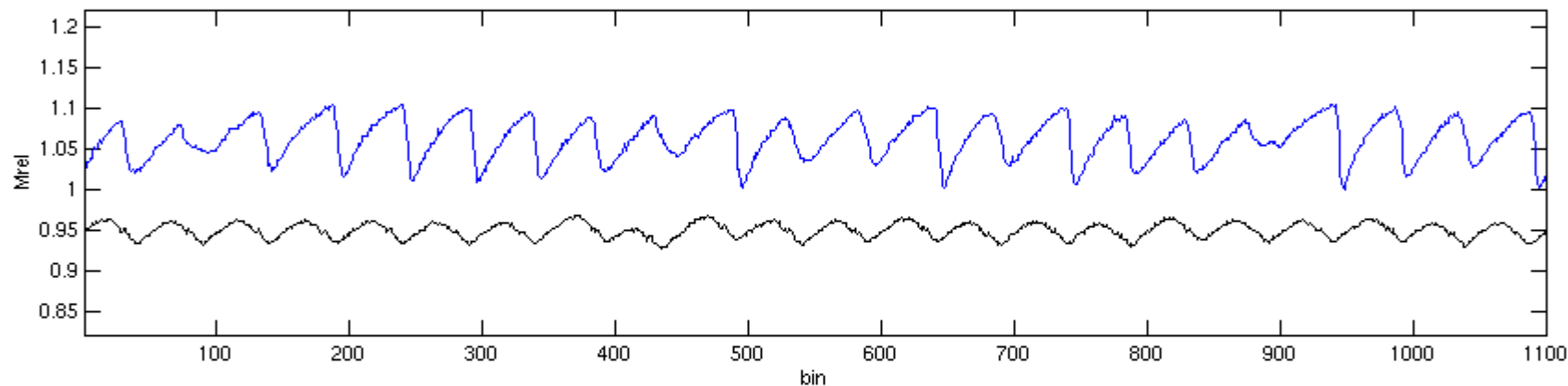
Relative Mach Number 12500 RPMC Tip Mrel =1.074



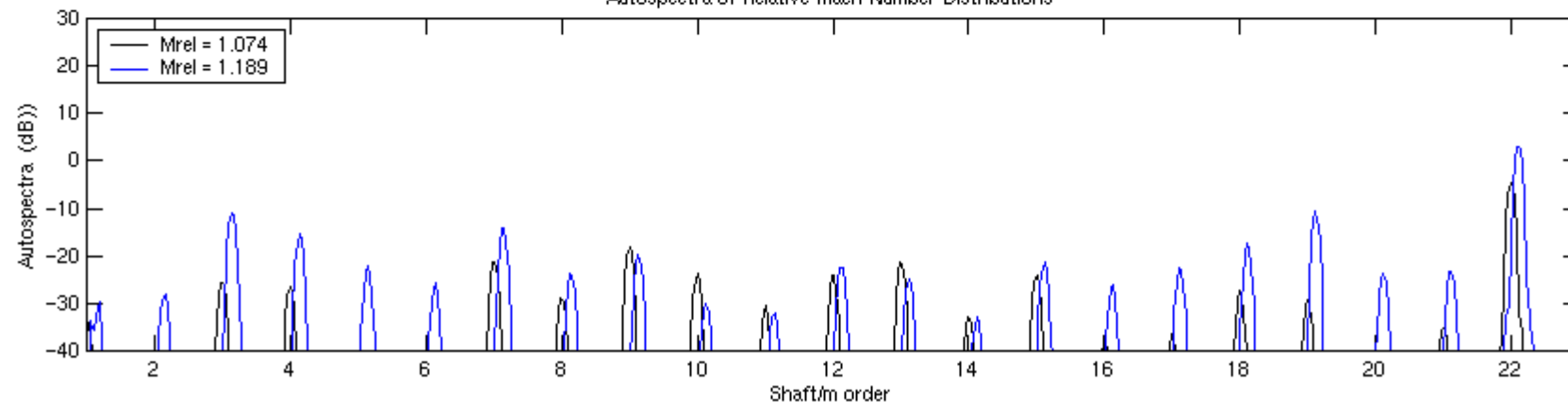
Relative Mach Number 13830 RPMC Tip Mrel =1.19



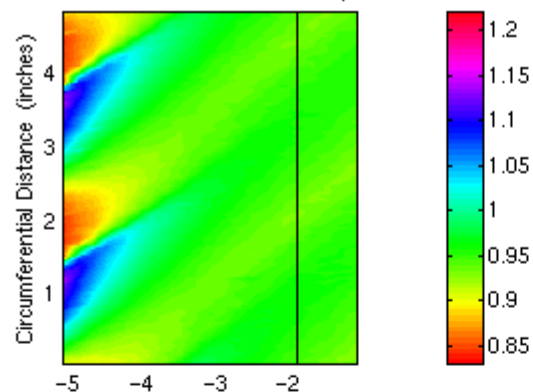
Relative Mach Number Distribution Across Rotor Rev



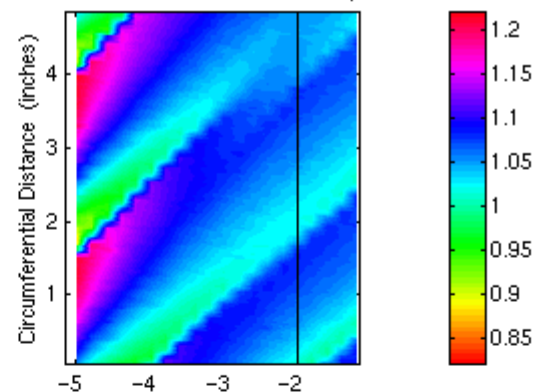
Autospectra of Relative Mach Number Distributions



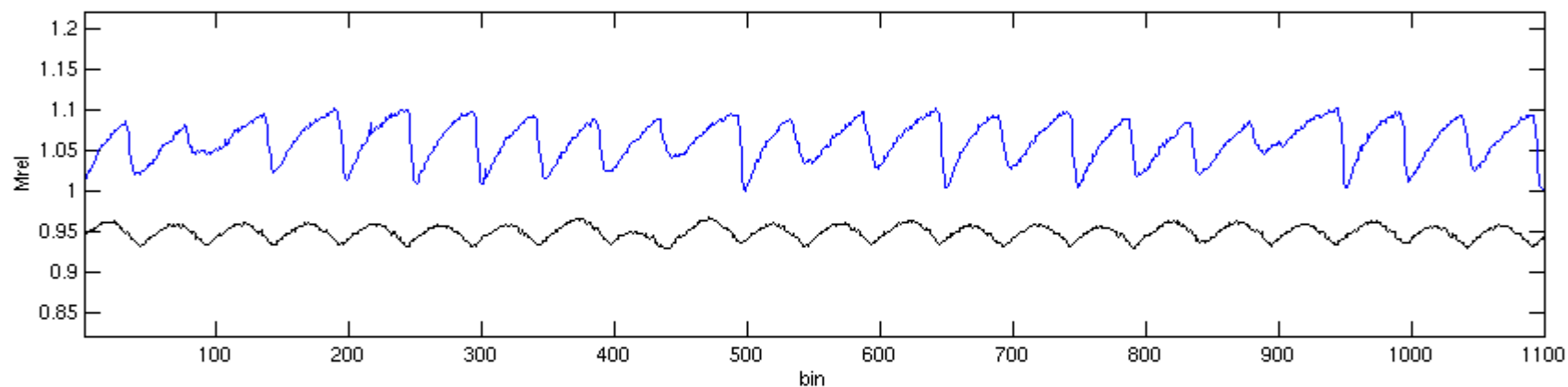
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



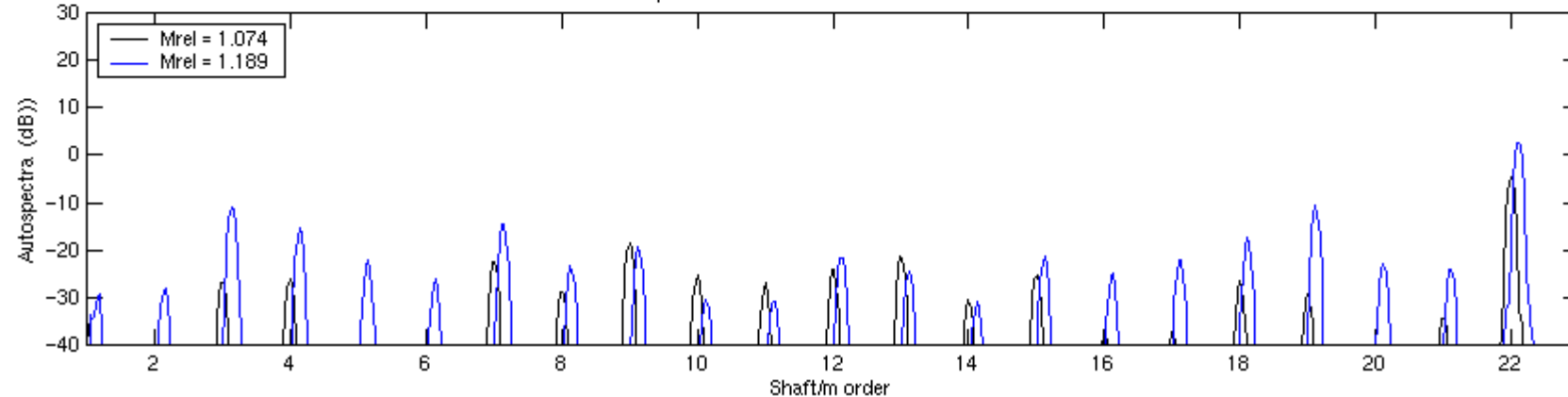
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



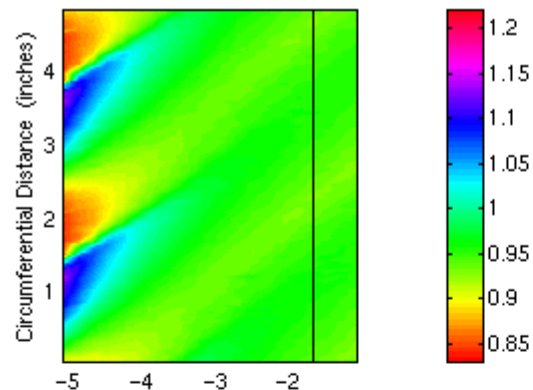
Relative Mach Number Distribution Across Rotor Rev



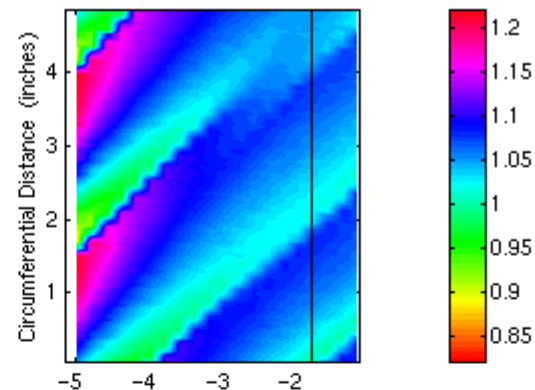
Autospectra of Relative Mach Number Distributions



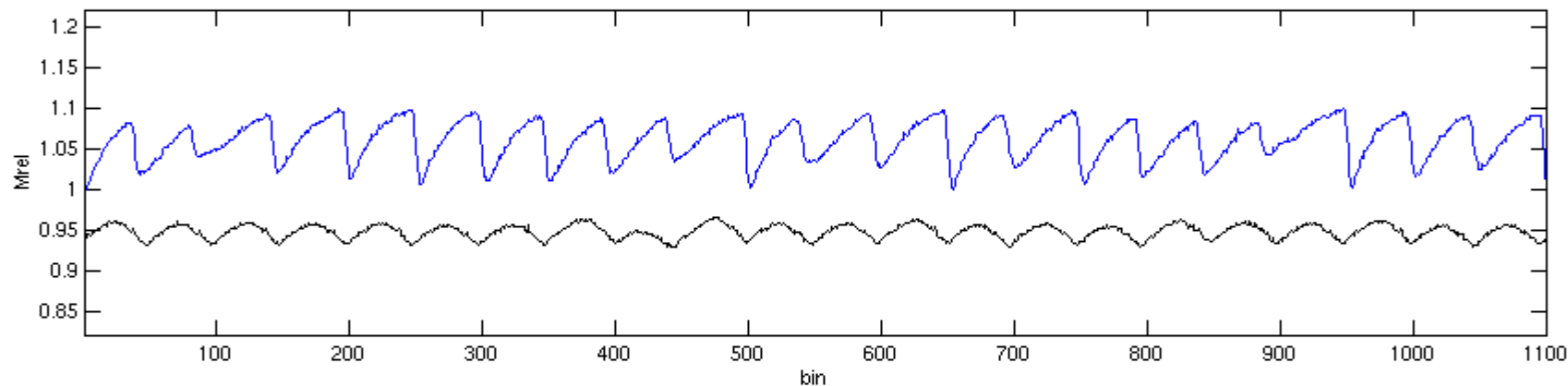
Relative Mach Number 12500 RPMC Tip Mrel =1.074



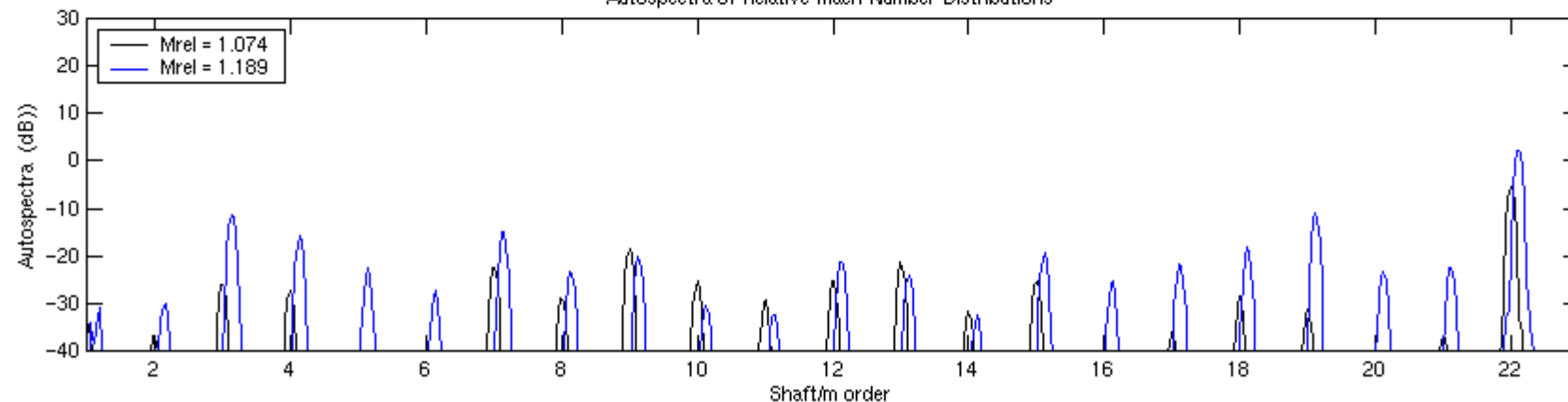
Relative Mach Number 13830 RPMC Tip Mrel =1.19



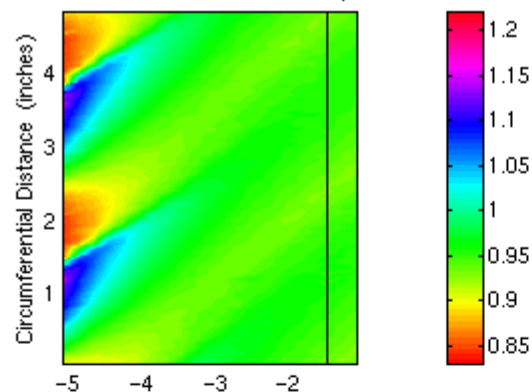
Relative Mach Number Distribution Across Rotor Rev



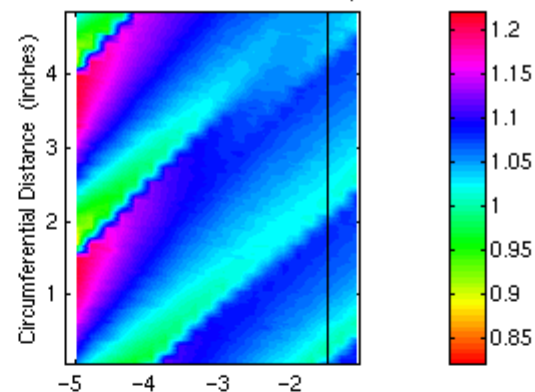
Autospectra of Relative Mach Number Distributions



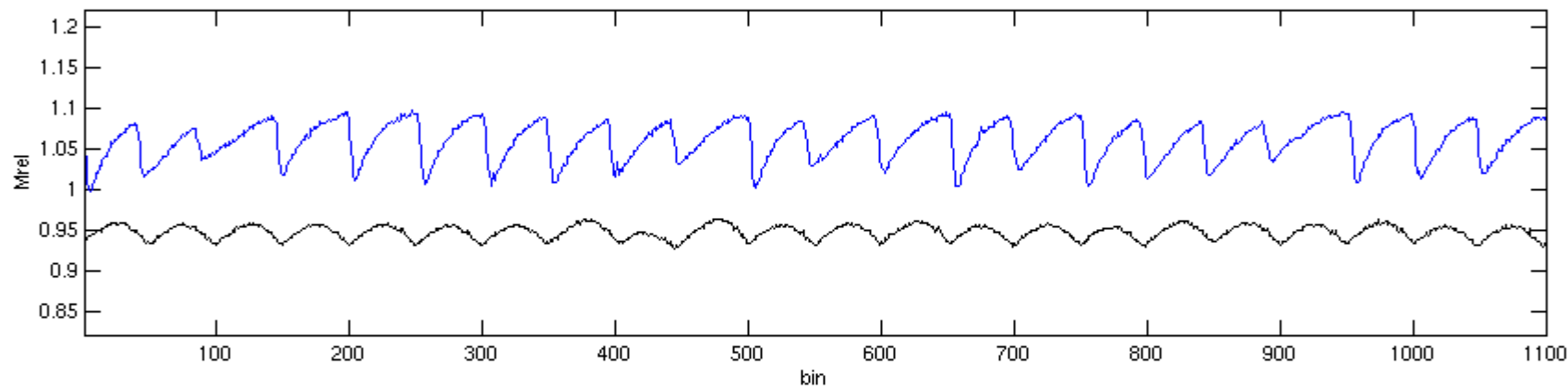
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



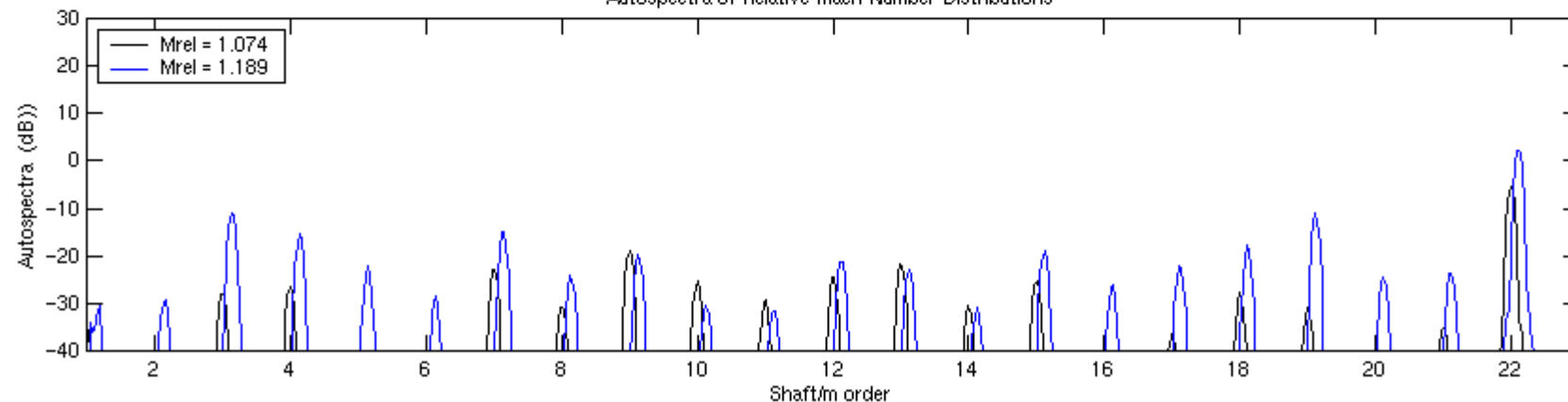
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



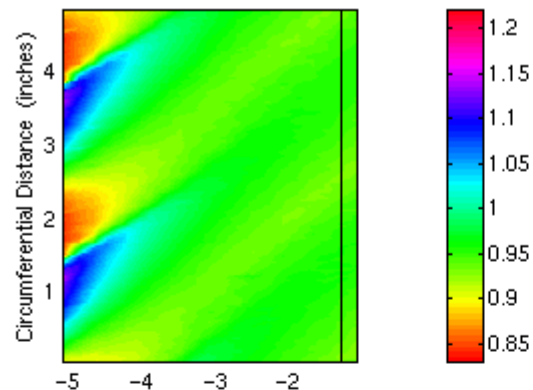
Relative Mach Number Distribution Across Rotor Rev



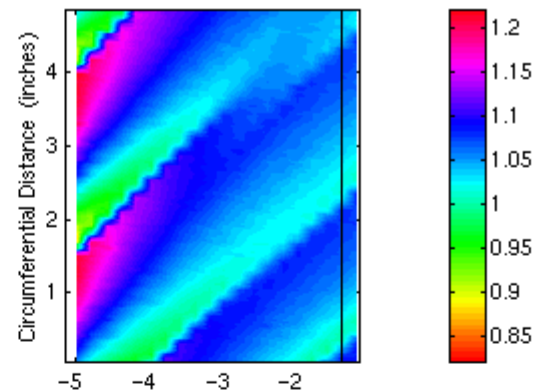
Autospectra of Relative Mach Number Distributions



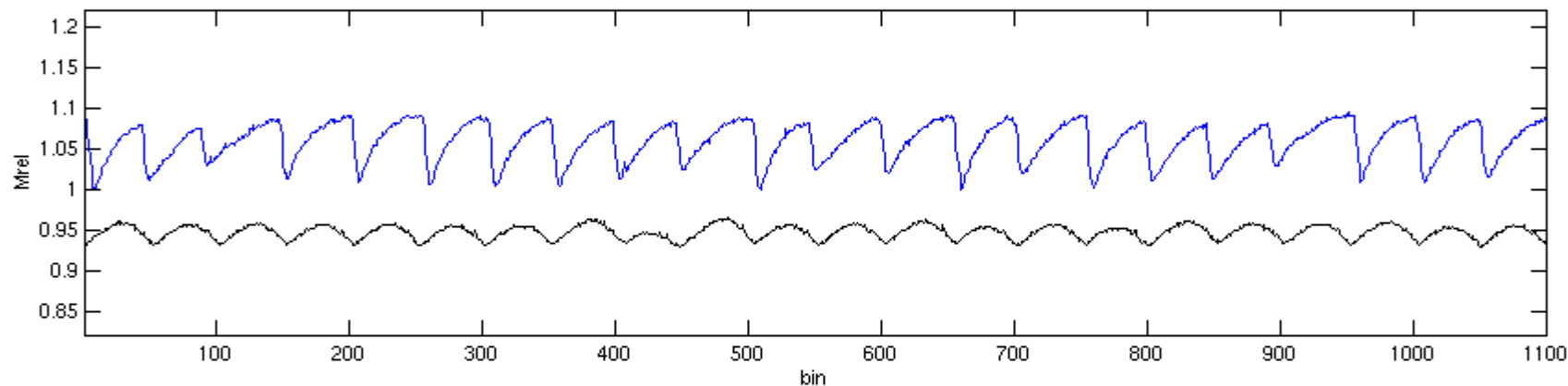
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



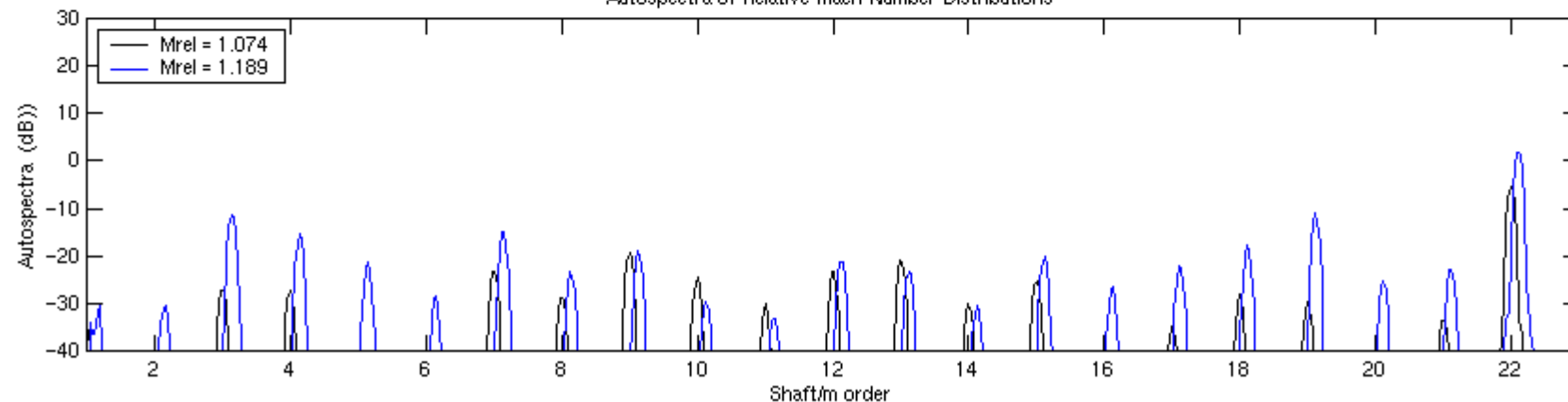
Relative Mach Number 13830 RPMC Tip Mrel = 1.19



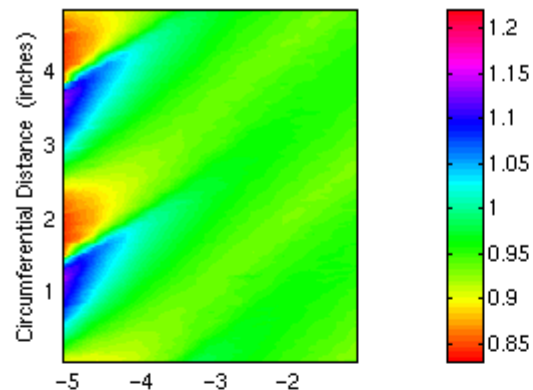
Relative Mach Number Distribution Across Rotor Rev



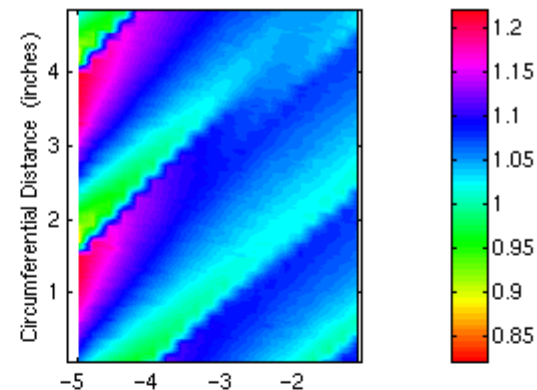
Autospectra of Relative Mach Number Distributions



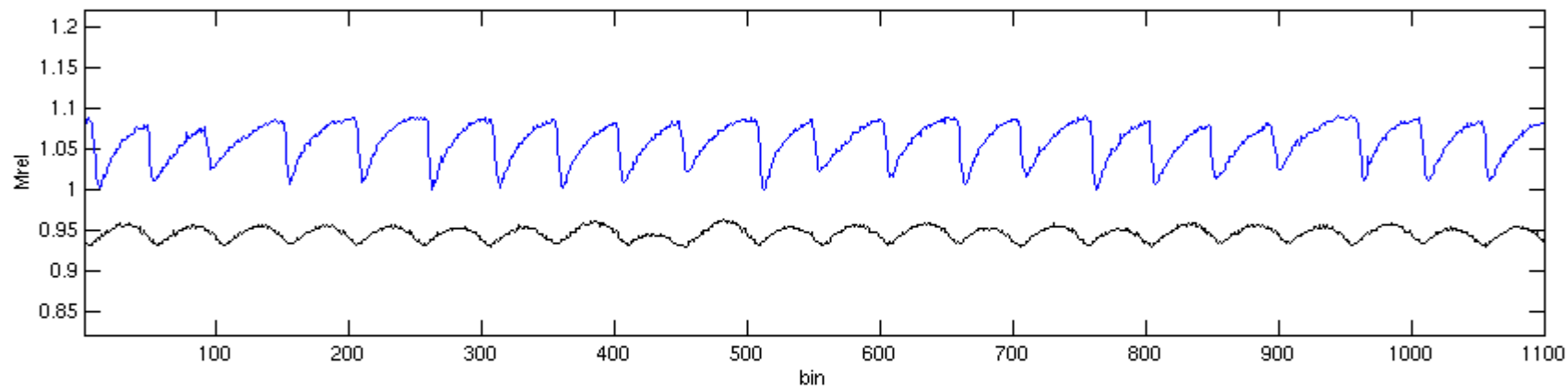
Relative Mach Number 12500 RPMC Tip Mrel = 1.074



Relative Mach Number 13830 RPMC Tip Mrel = 1.19



Relative Mach Number Distribution Across Rotor Rev



Autospectra of Relative Mach Number Distributions

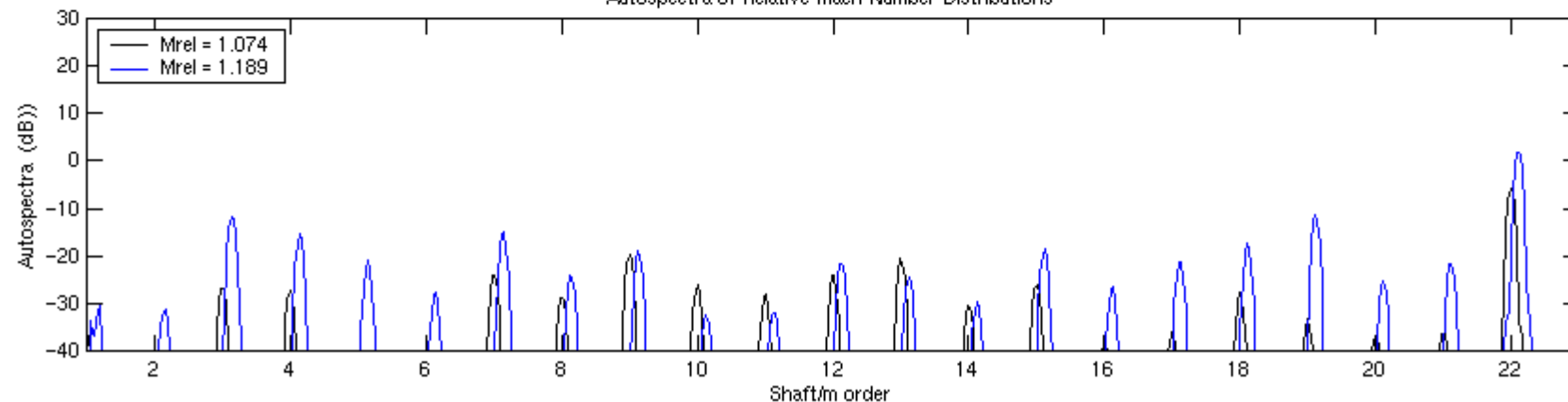


Figure 18.—Variation in the average amplitude of the disturbance measured upstream of the forward-swept fan with distance upstream of the leading edge.

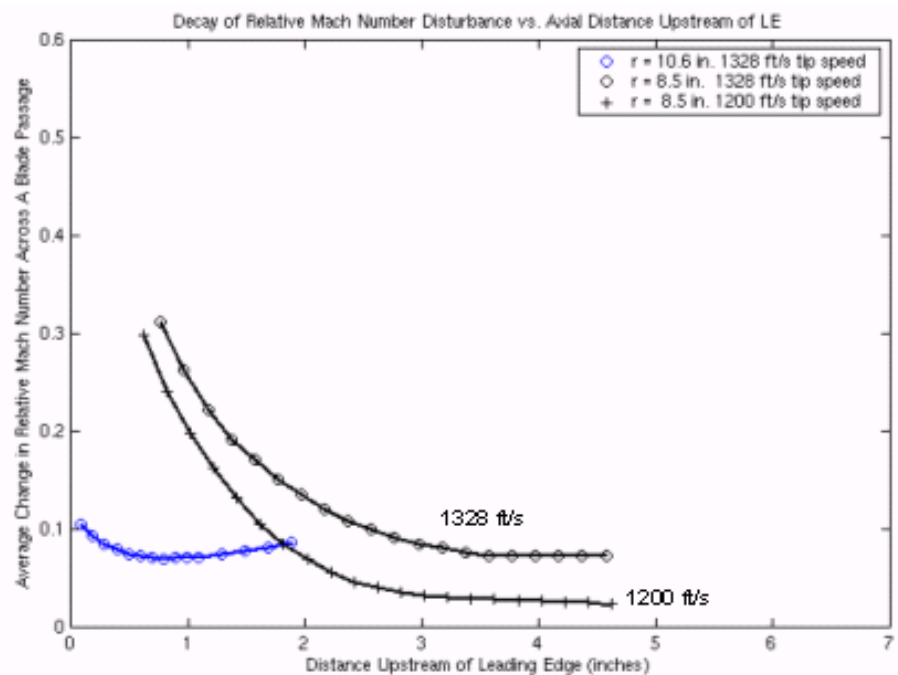
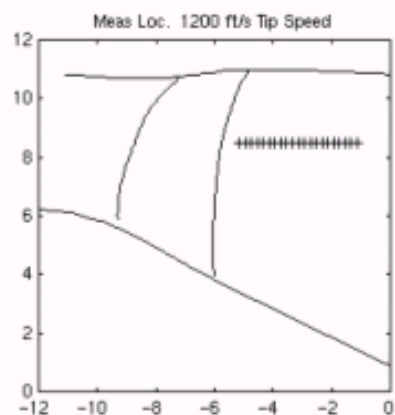
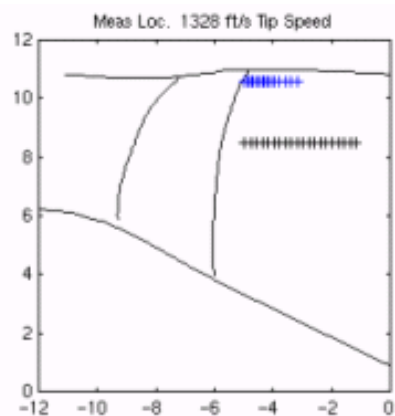
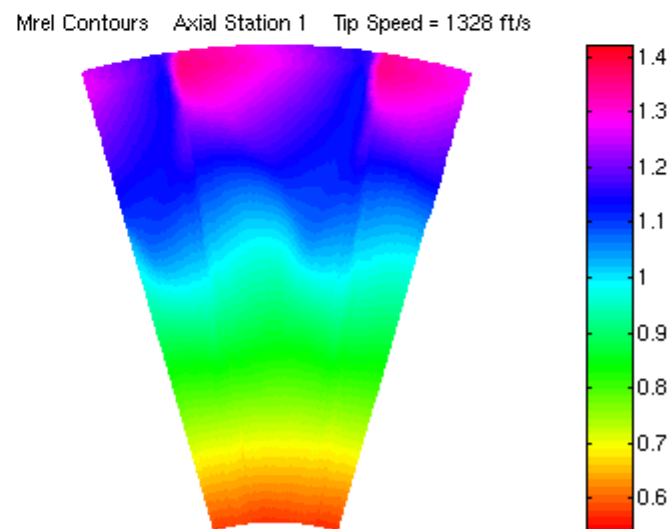
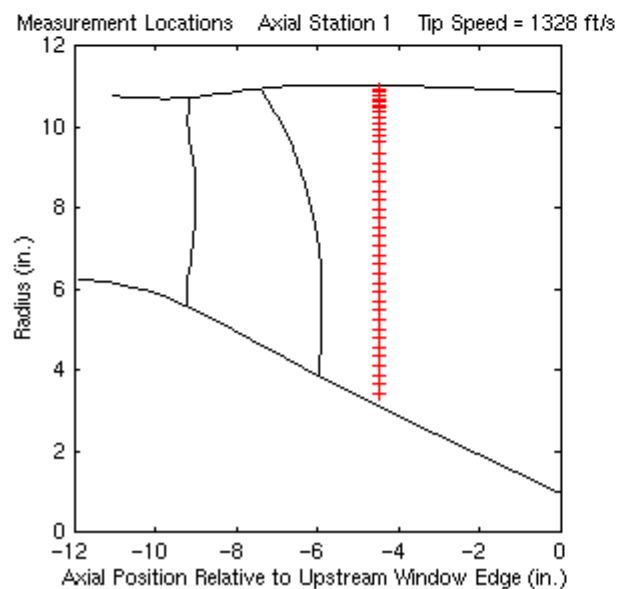
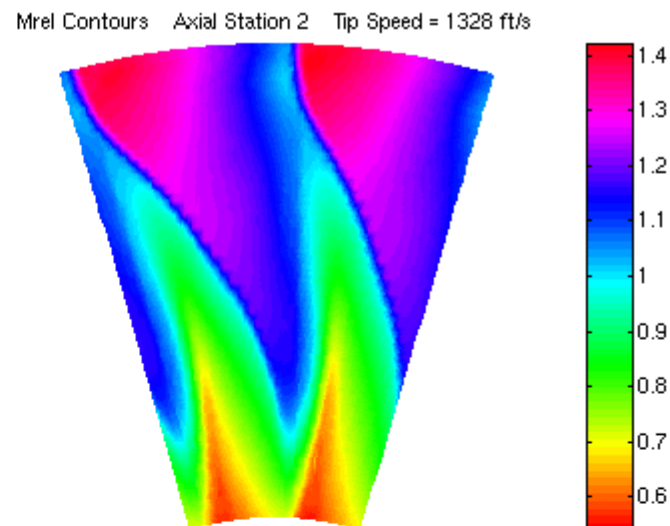
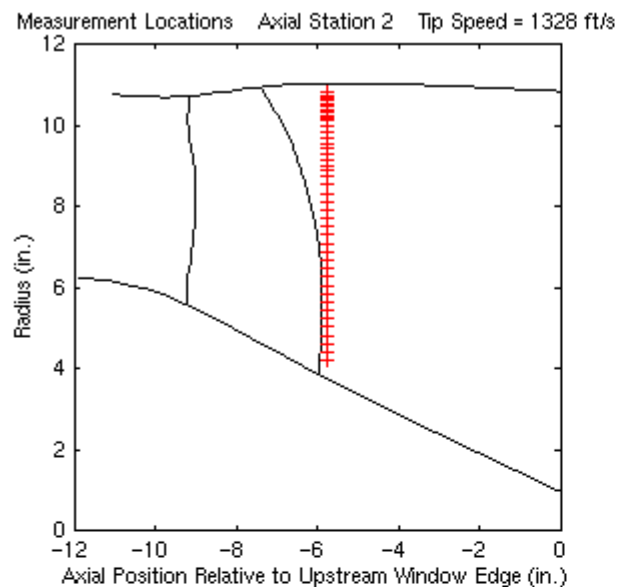
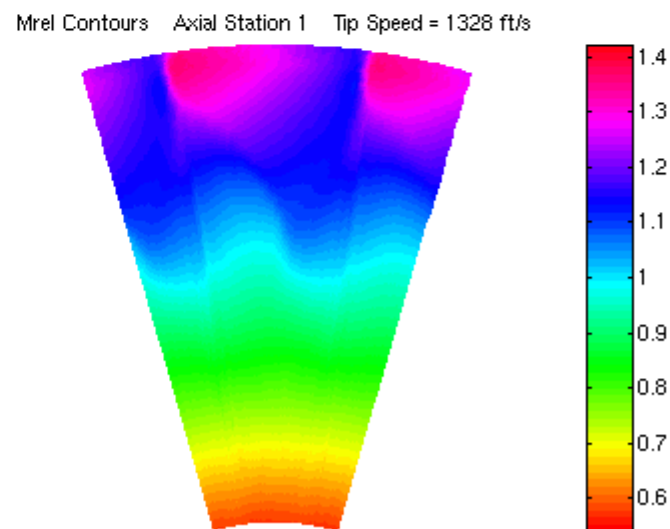
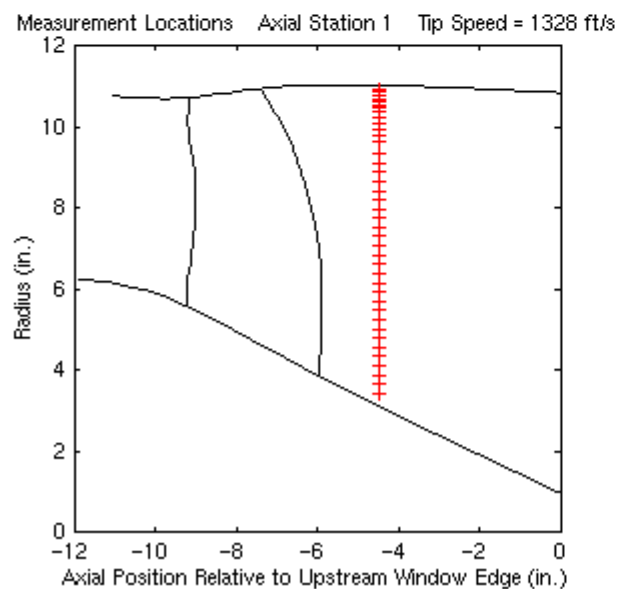
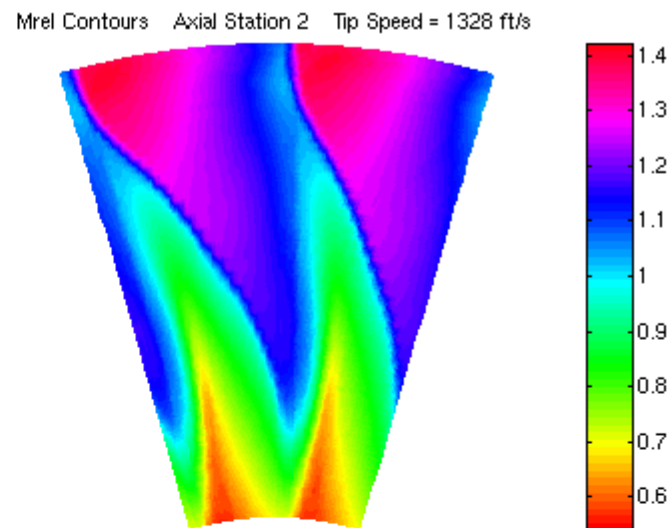
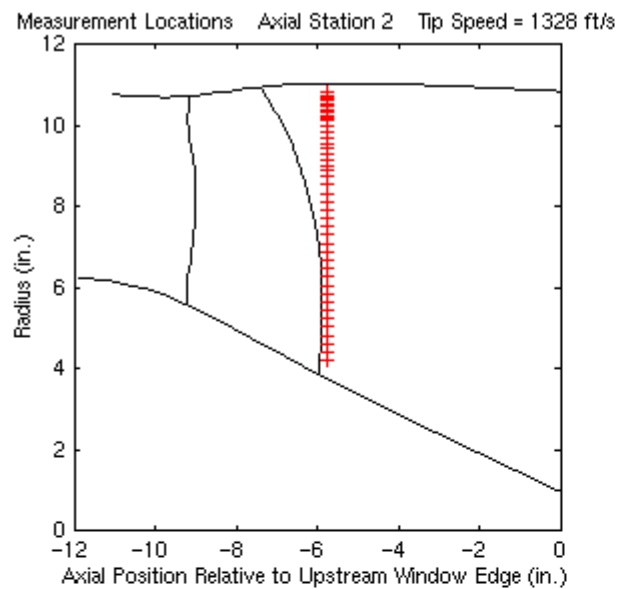
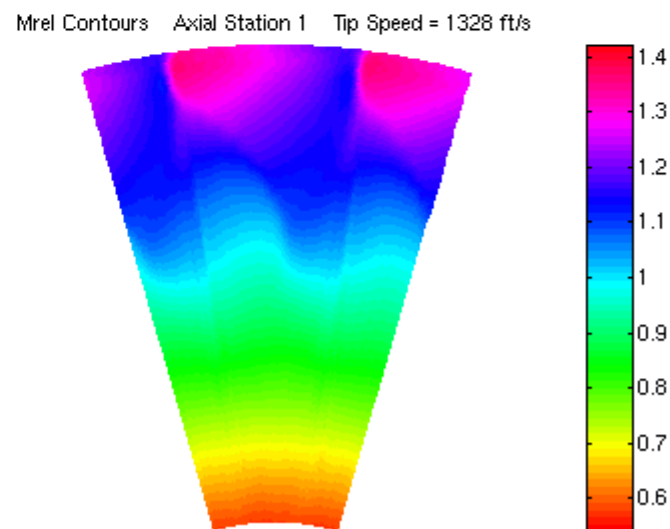
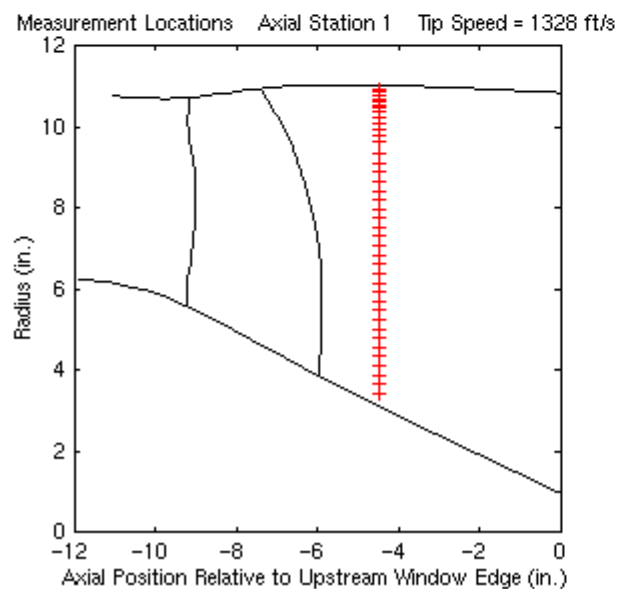
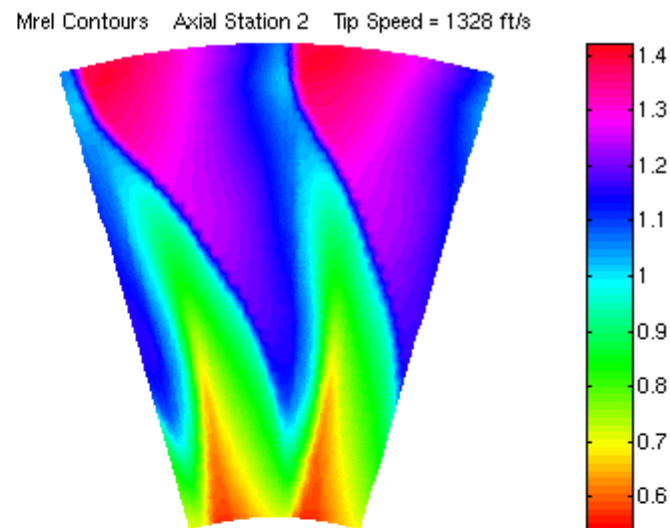
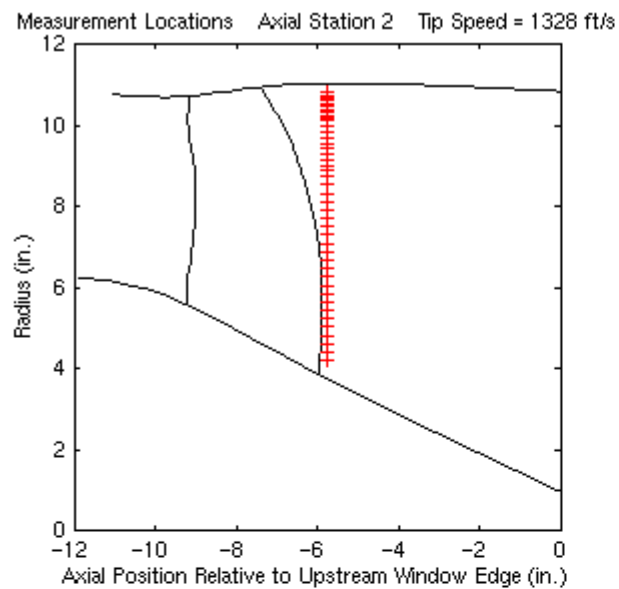
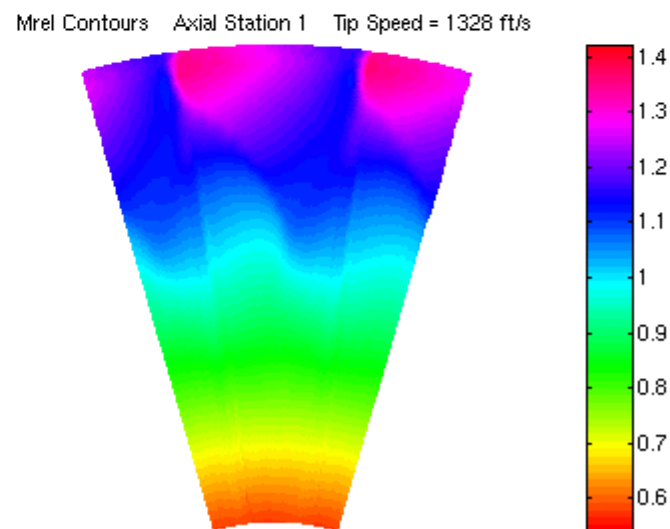
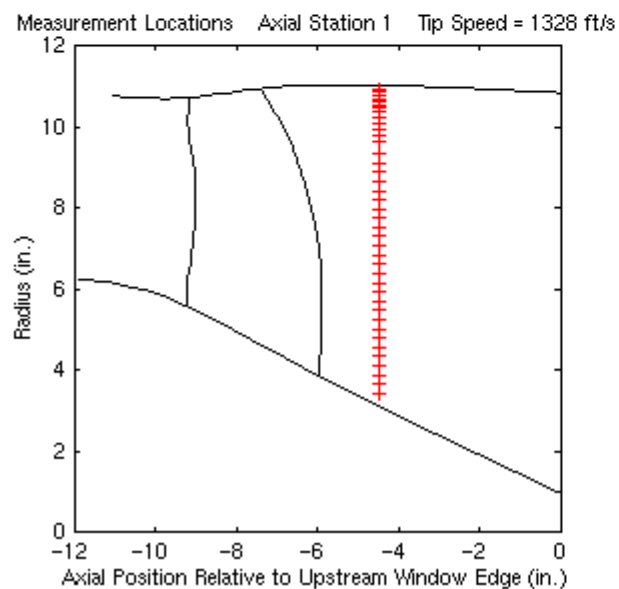
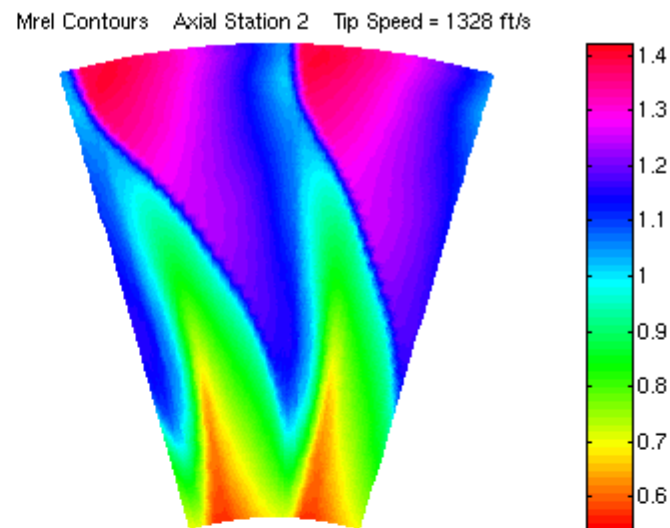
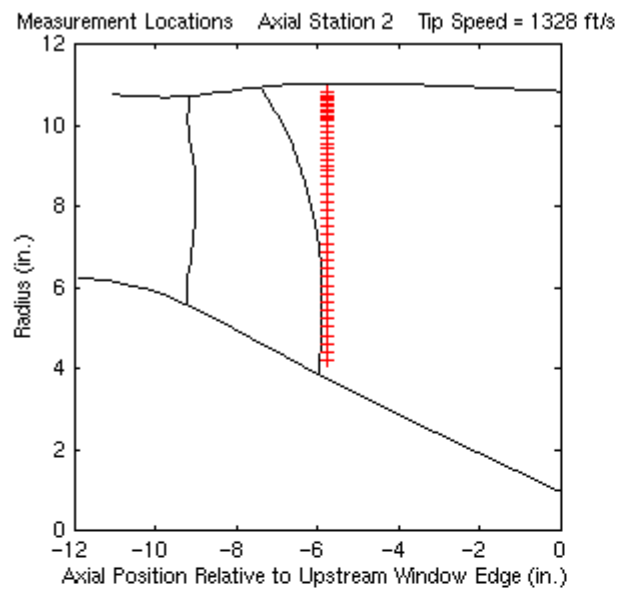


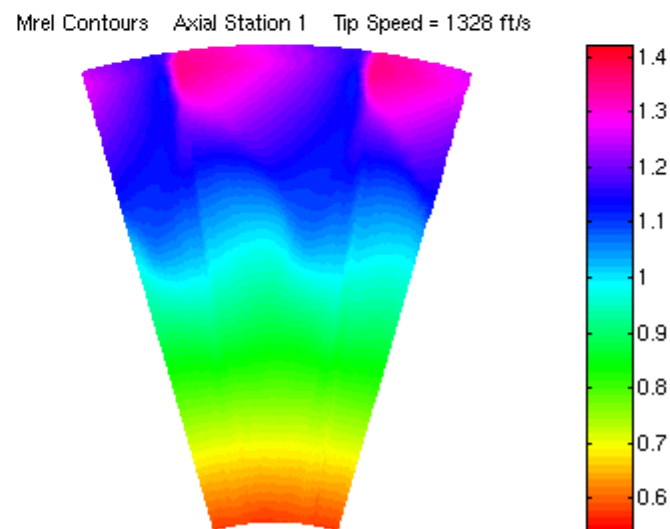
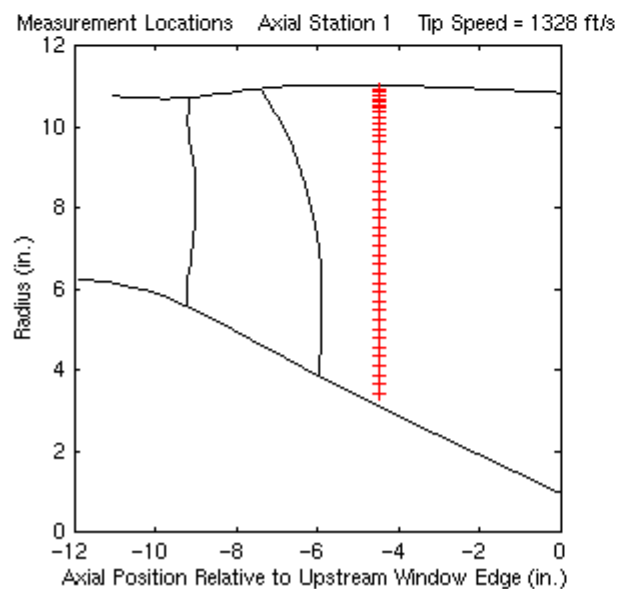
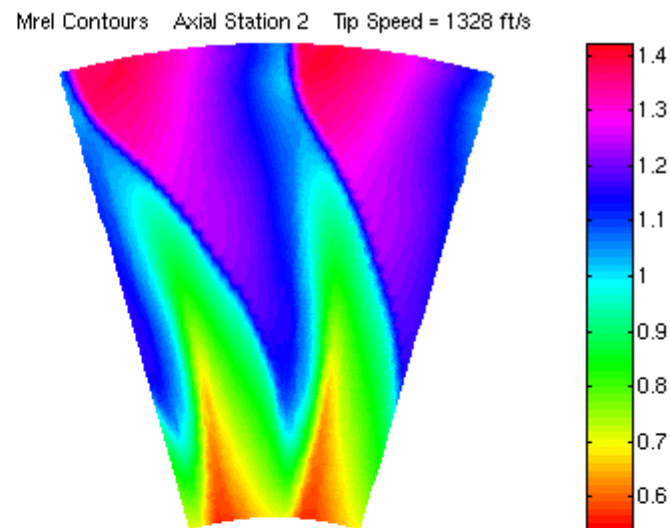
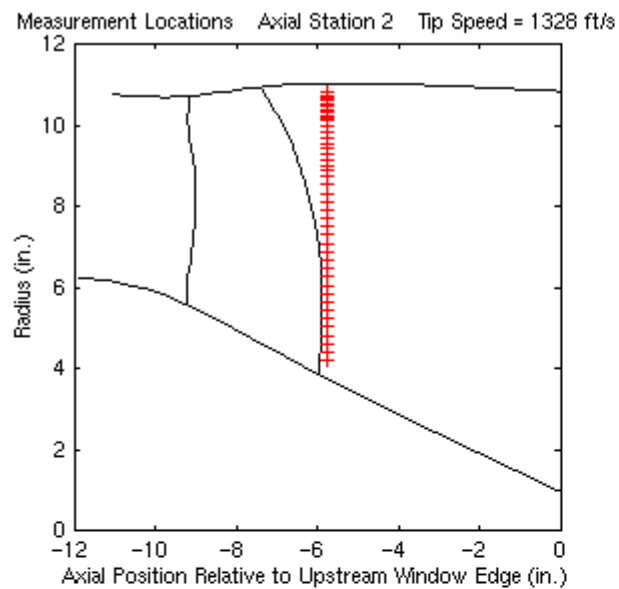
Figure 19.—Slideshow (22 slides) illustrating the blade-to-blade variations in the flow measured upstream of the aft-swept fan at axial stations 1 and 2 at the high-speed operating condition.

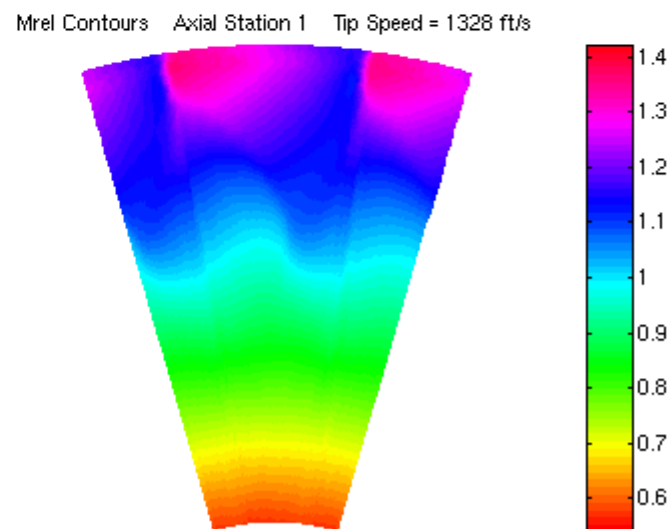
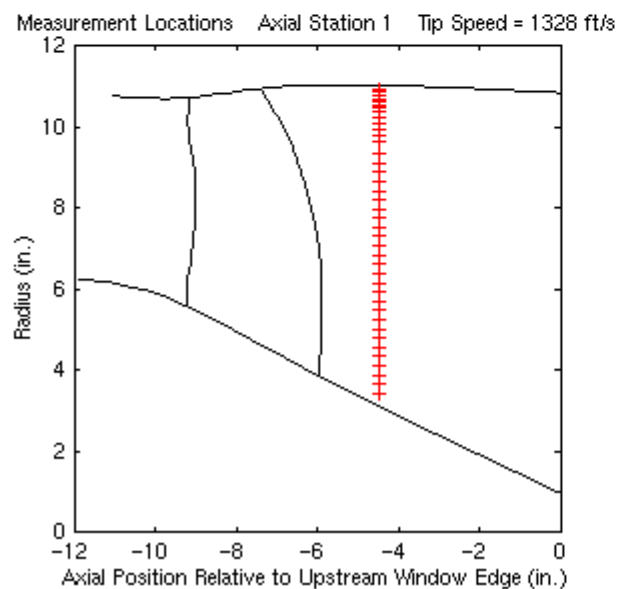
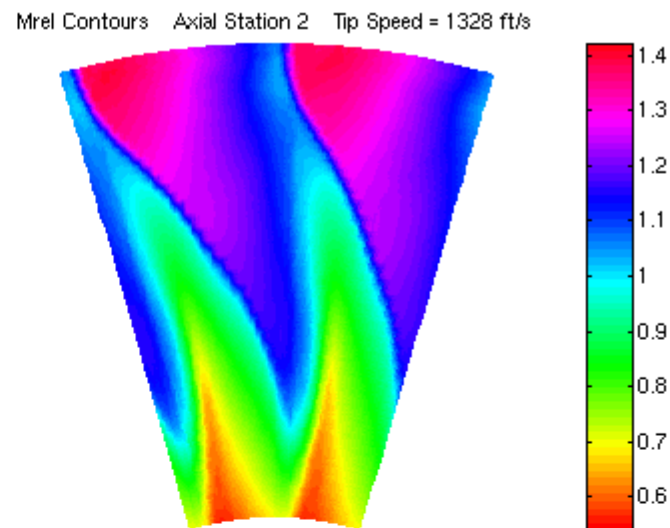
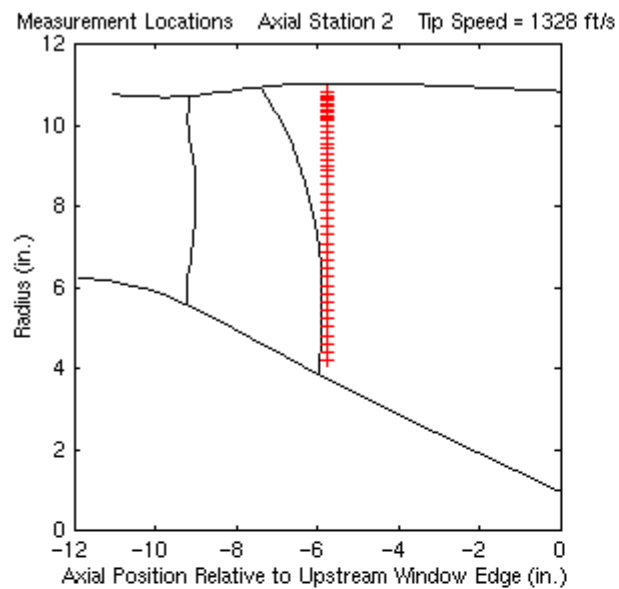


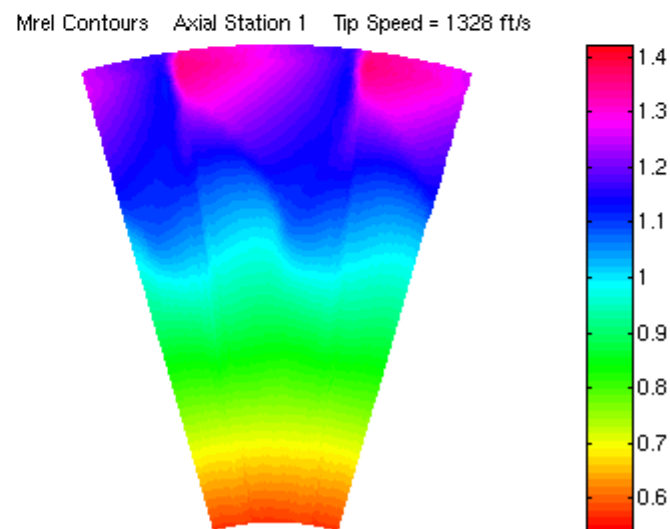
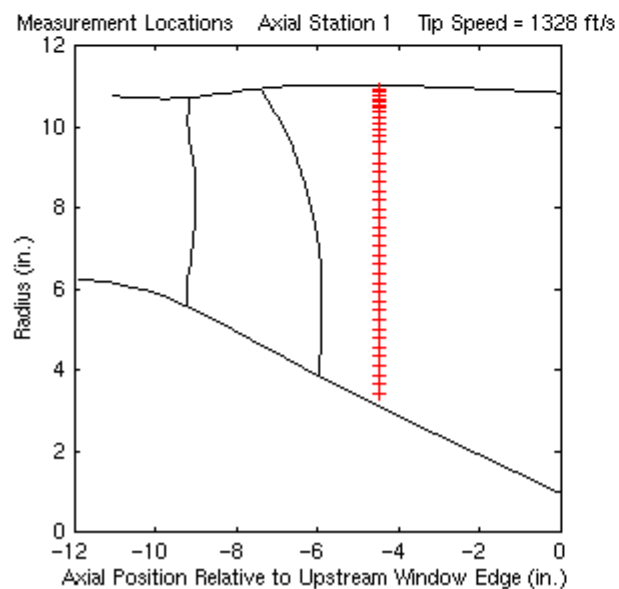
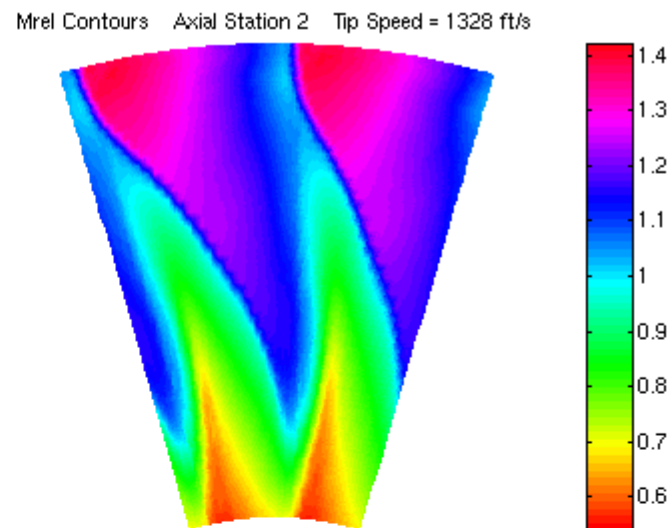
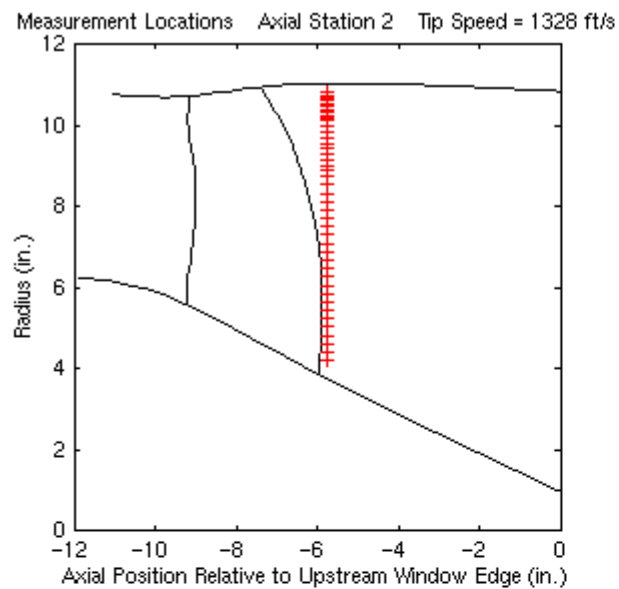


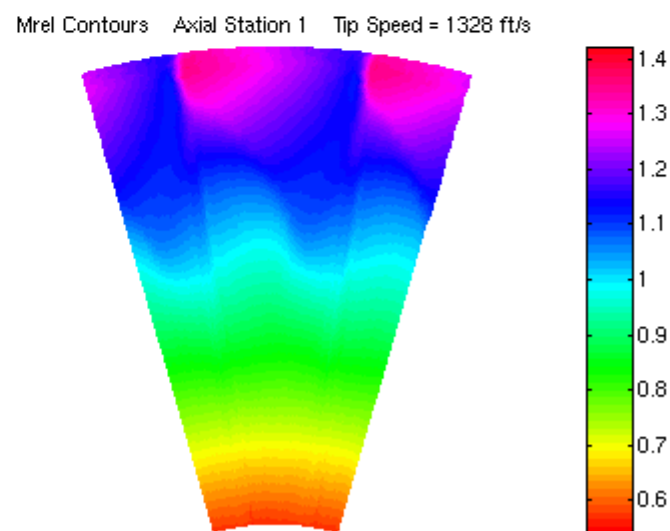
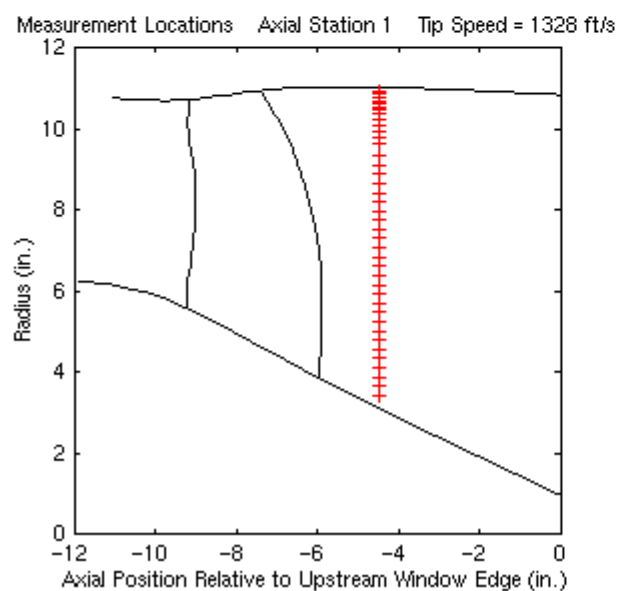
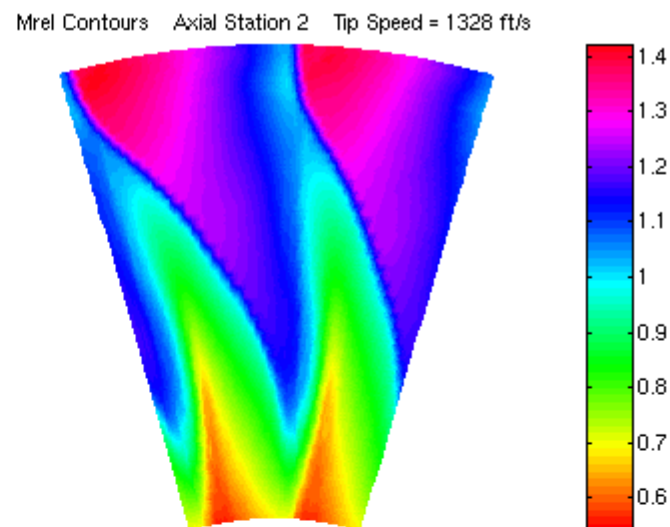
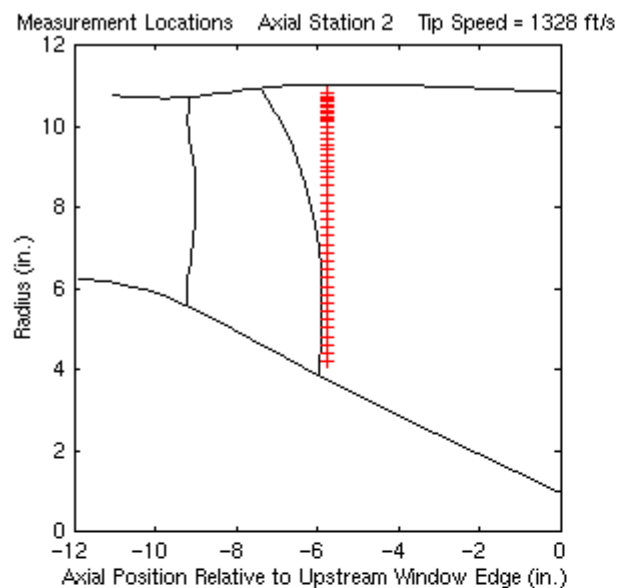


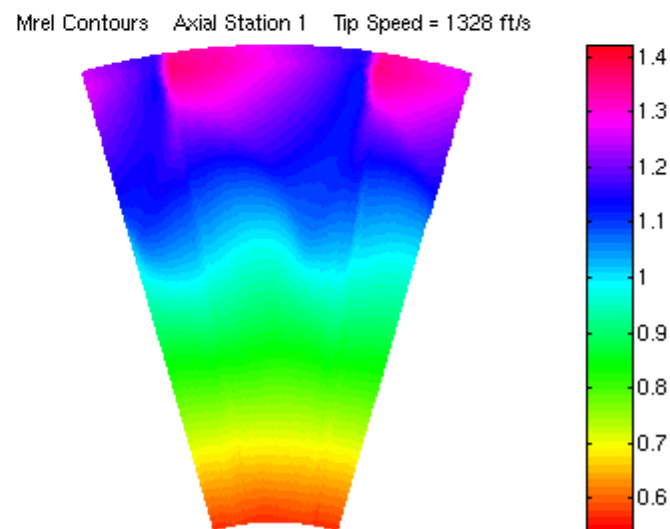
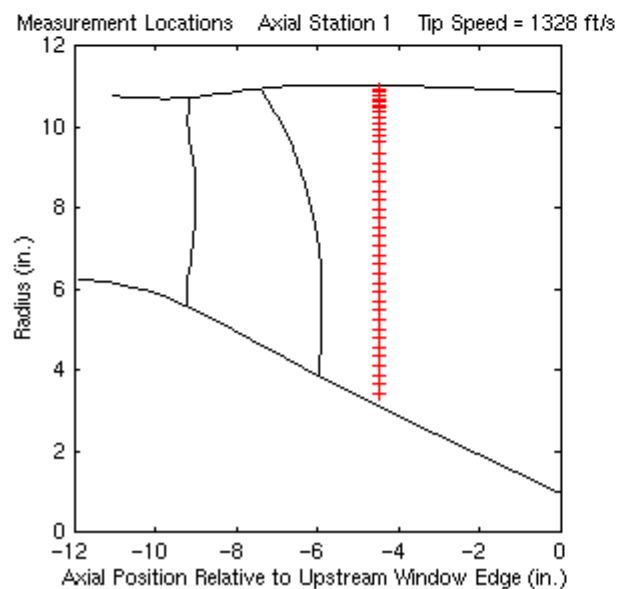
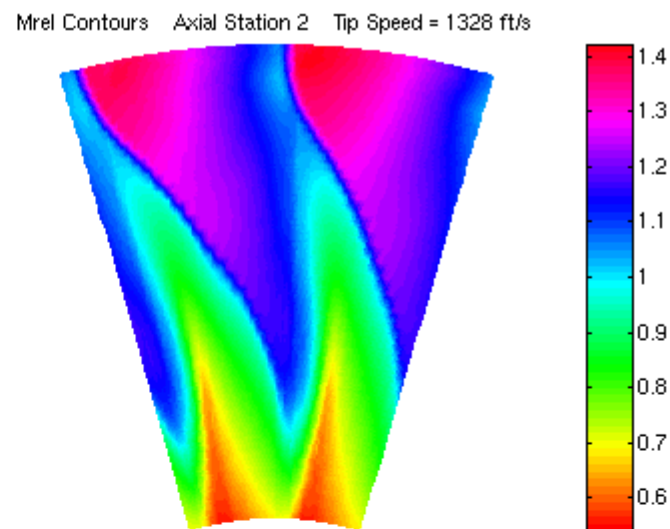
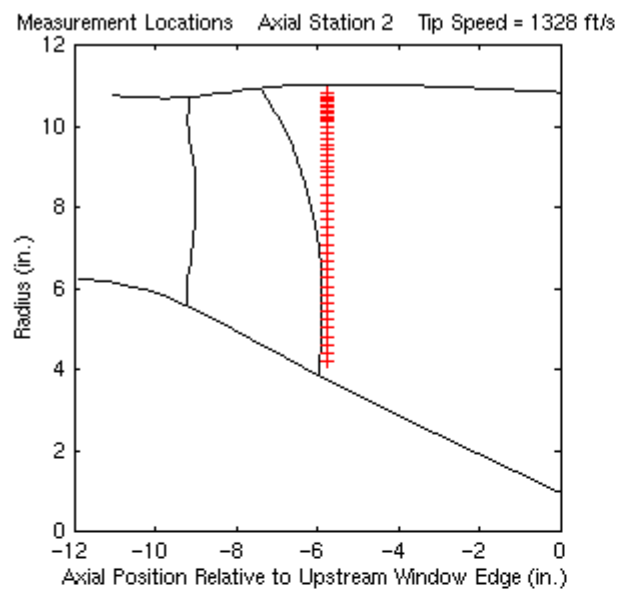


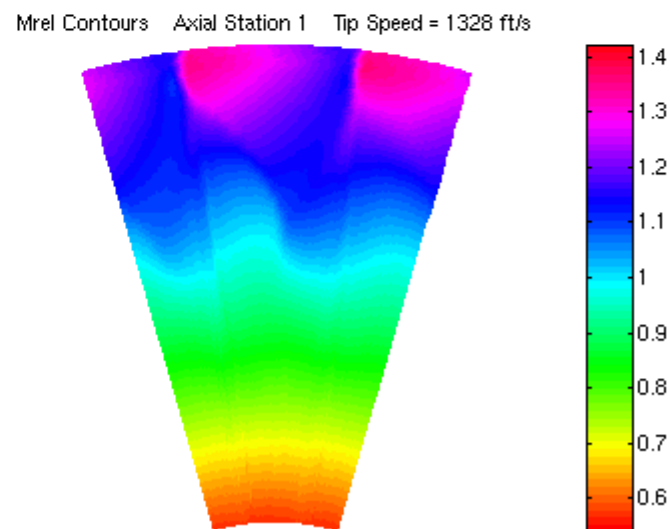
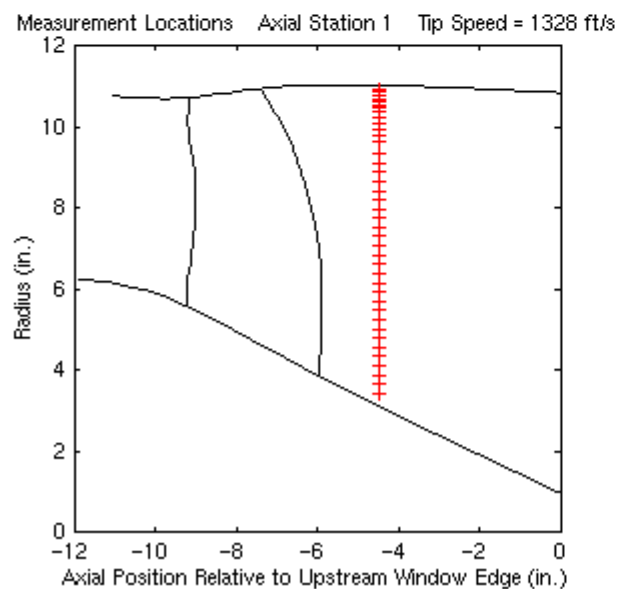
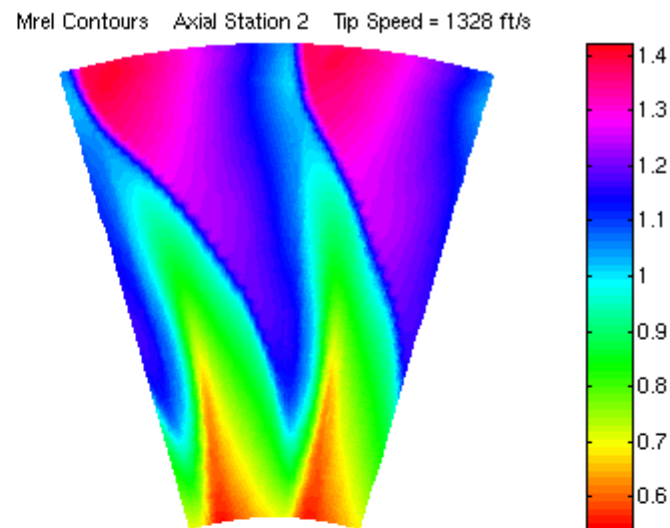
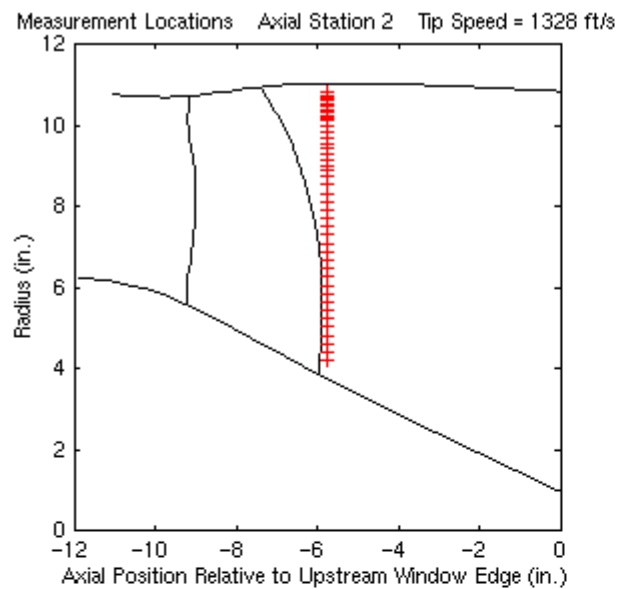


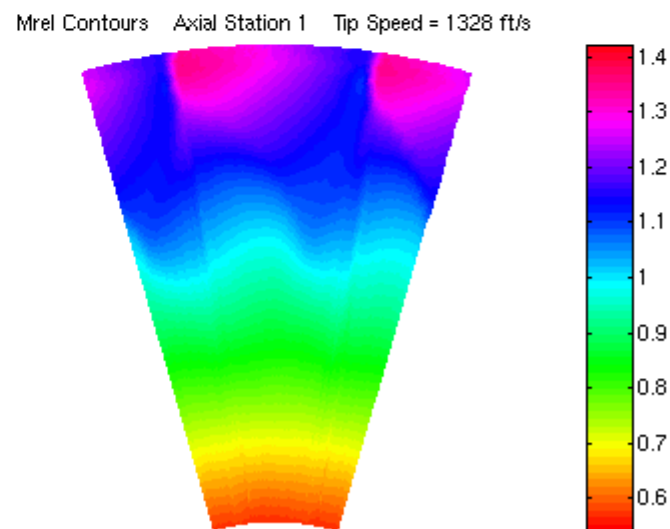
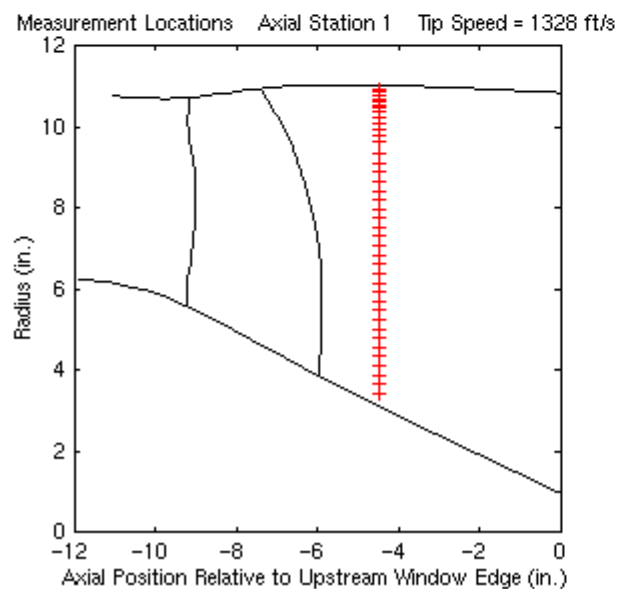
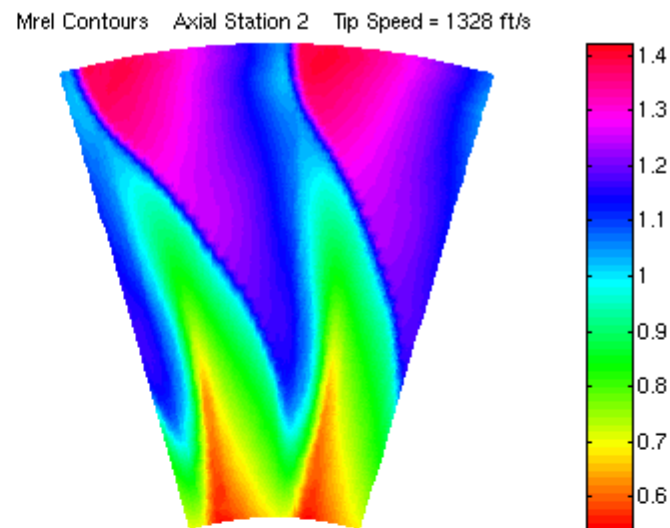
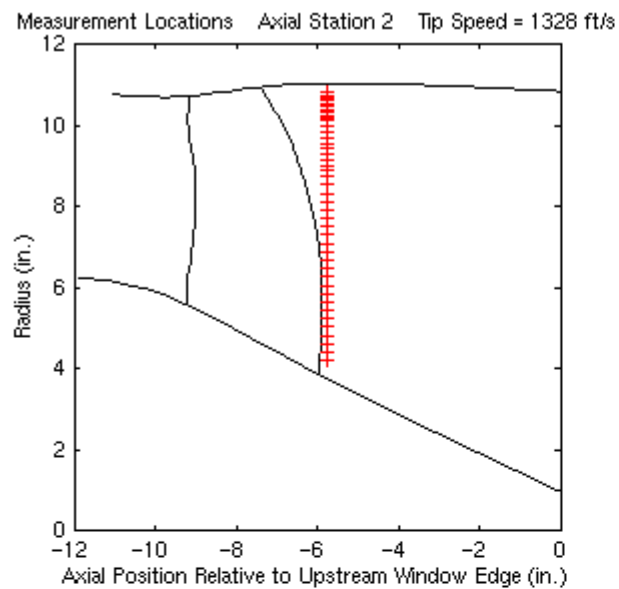


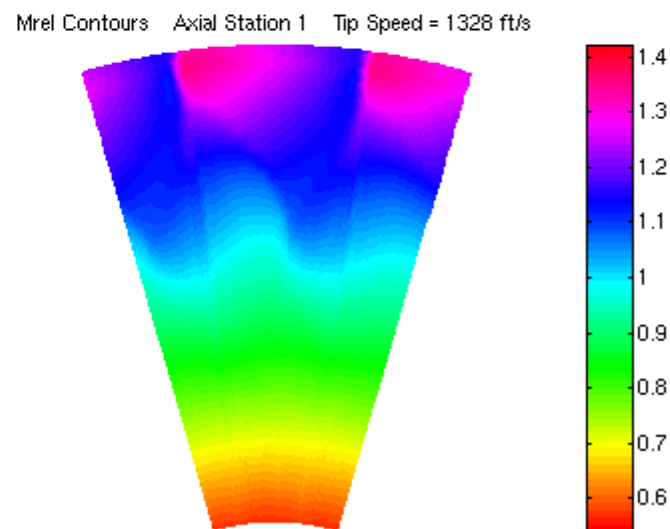
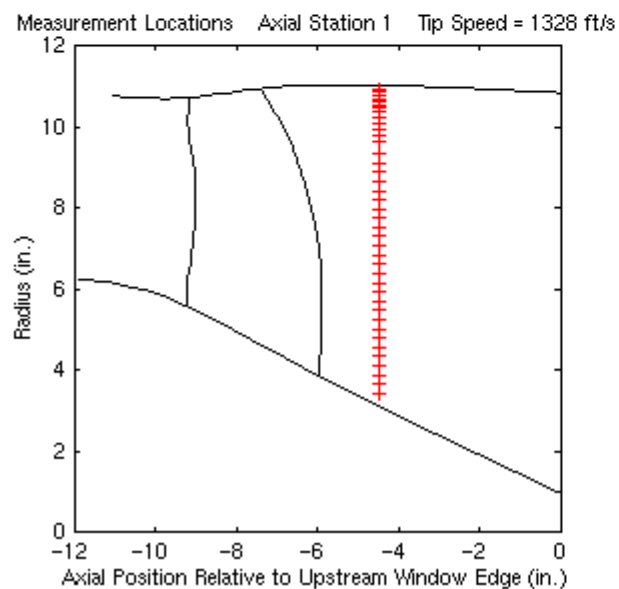
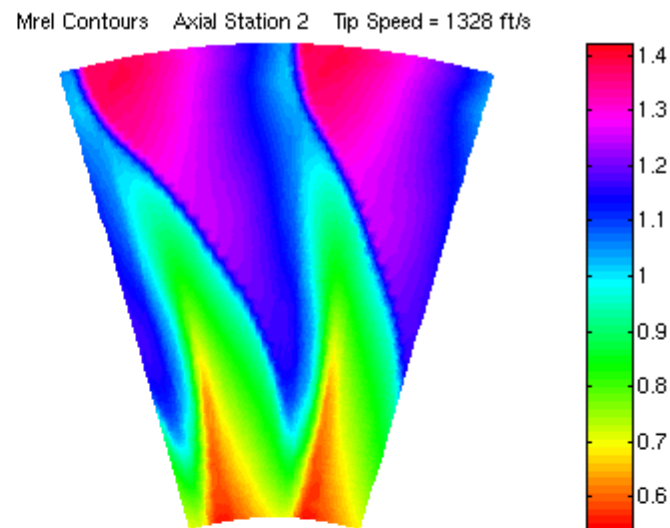
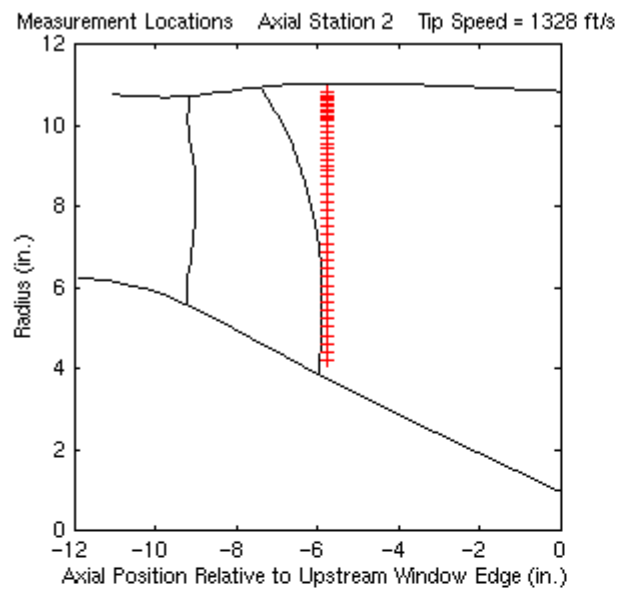


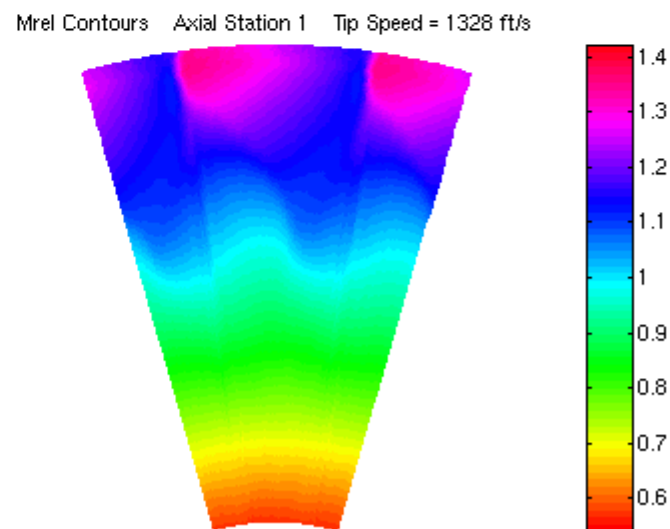
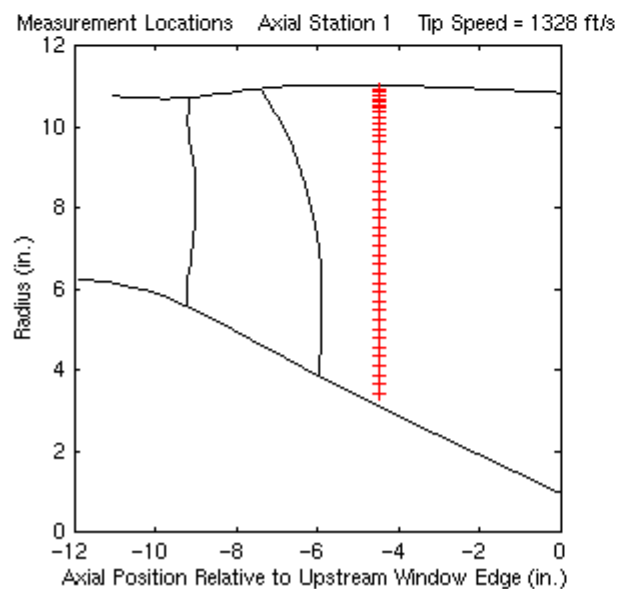
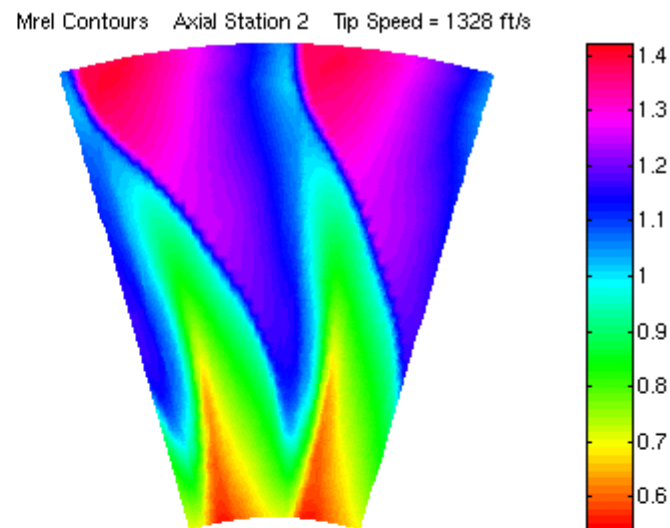
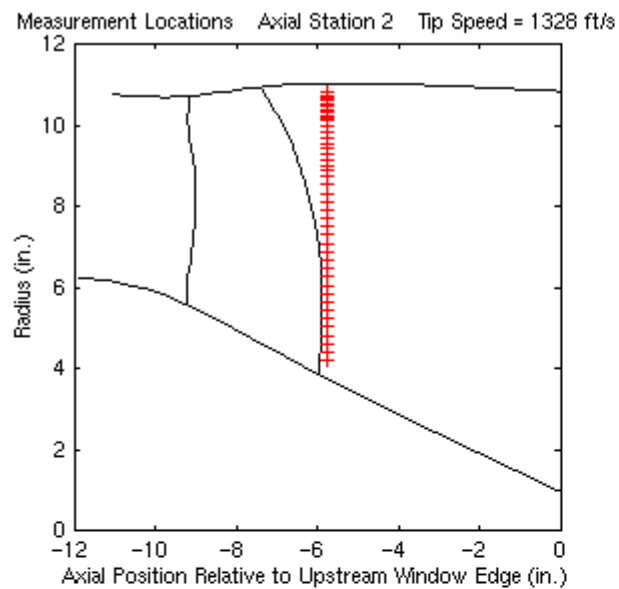


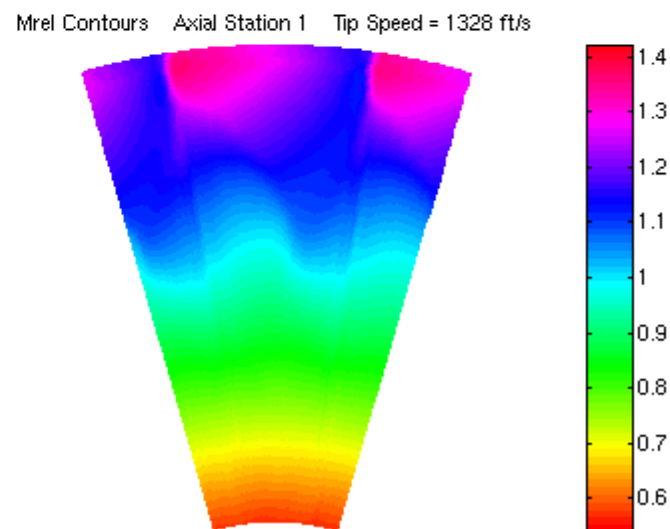
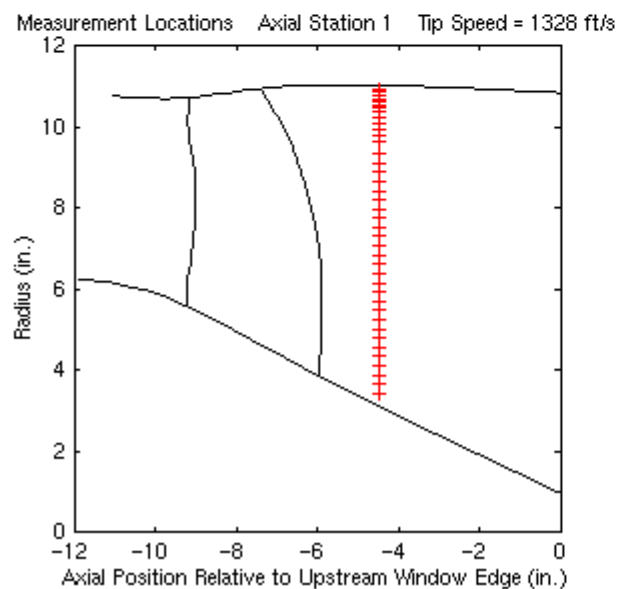
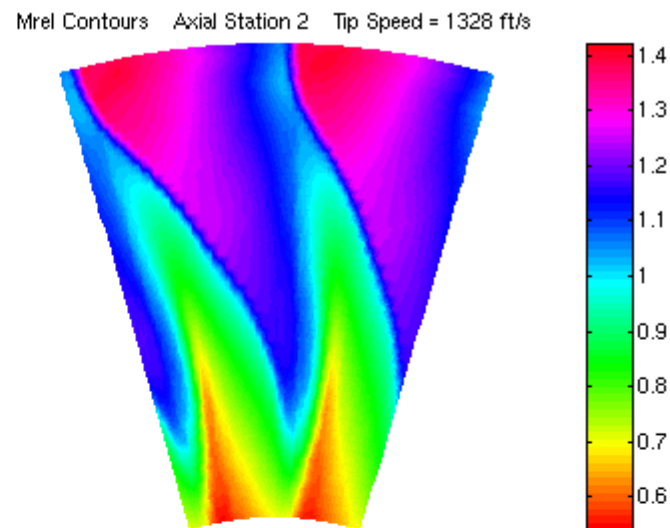
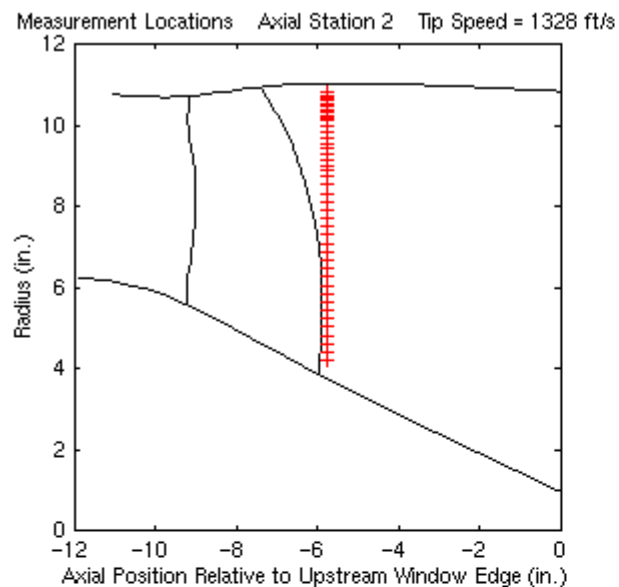


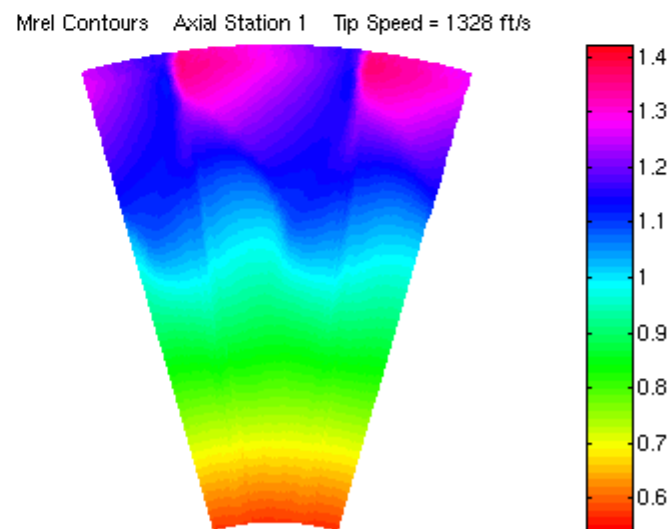
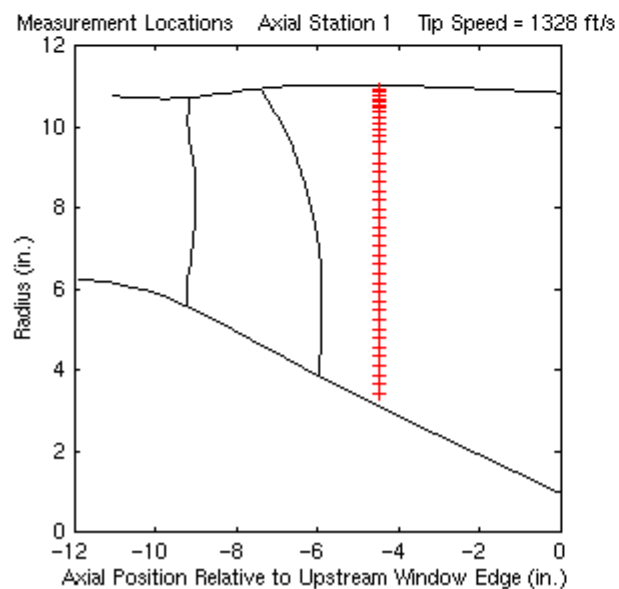
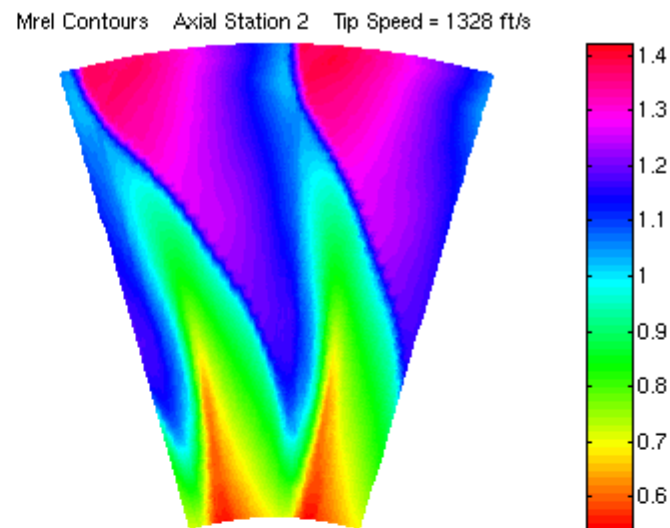
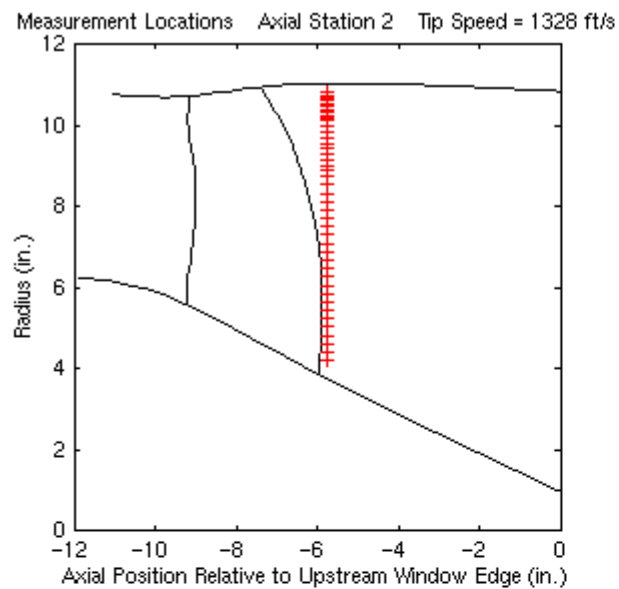


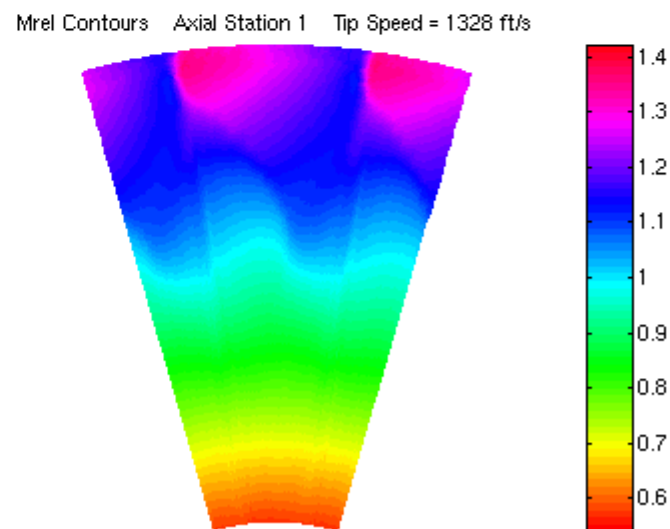
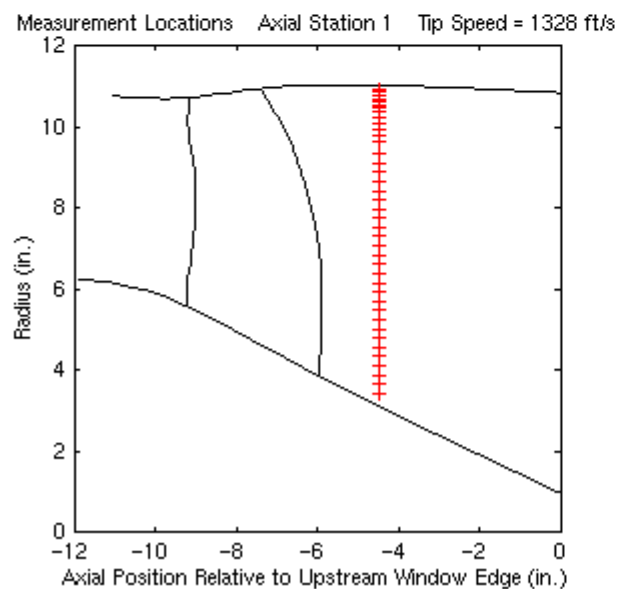
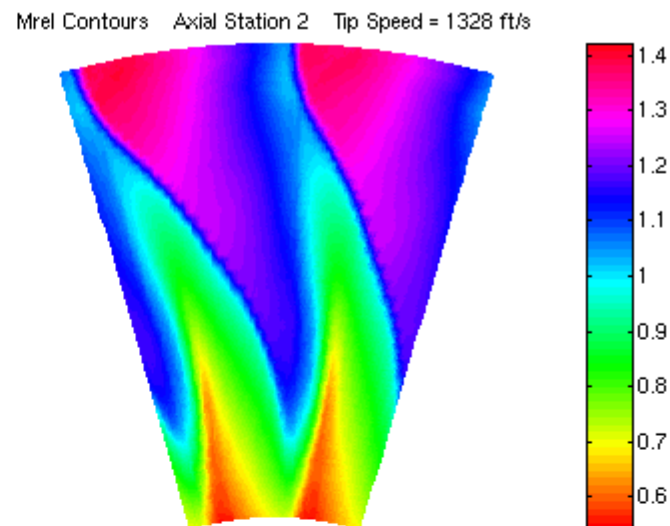
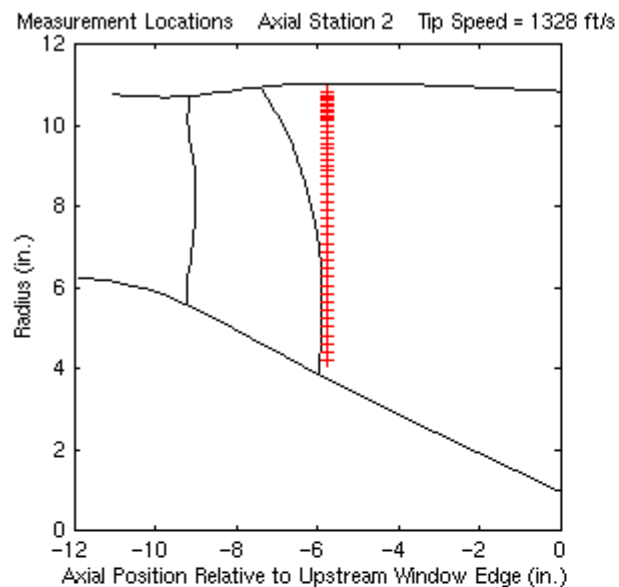


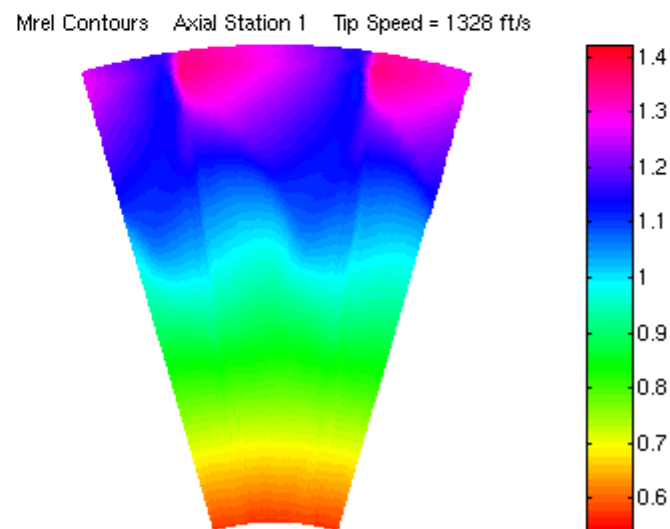
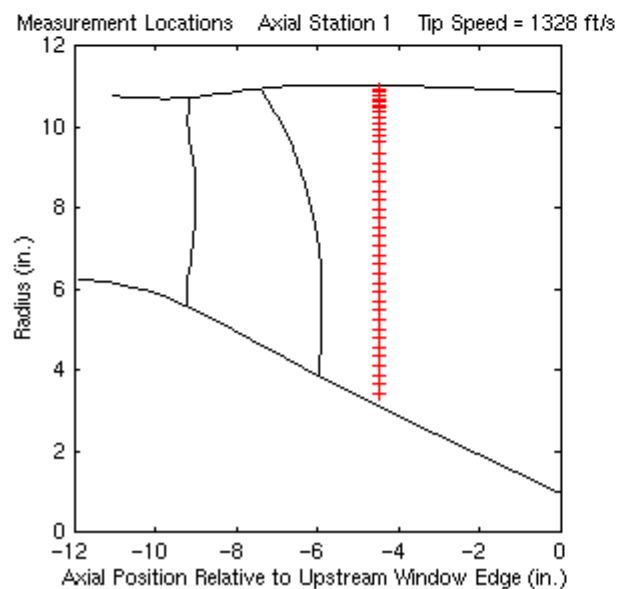
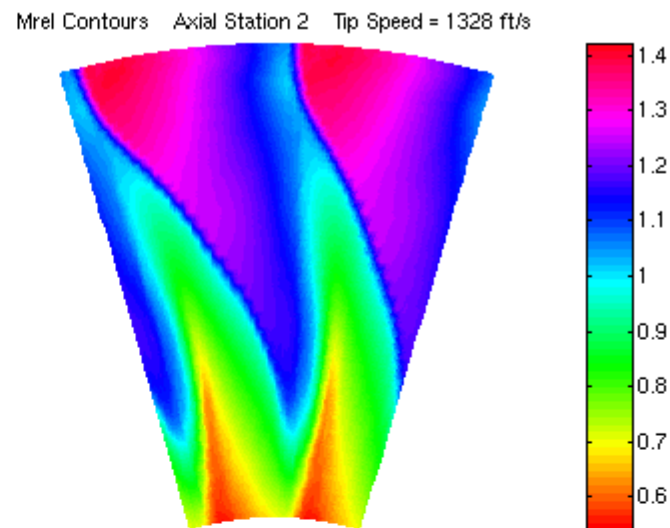
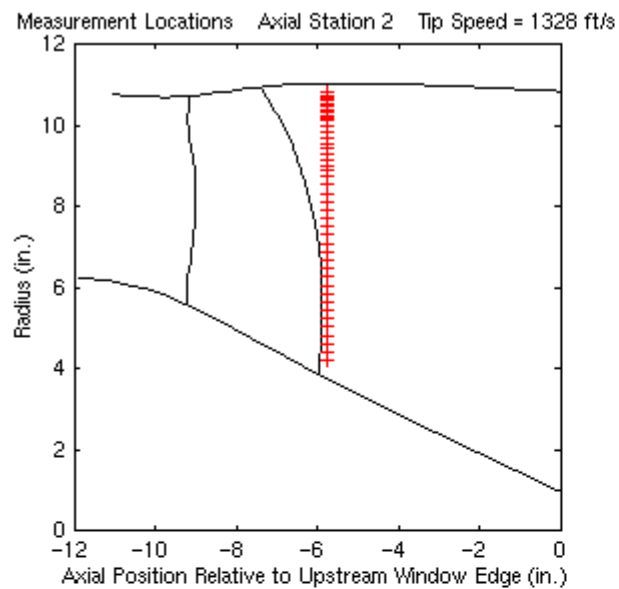


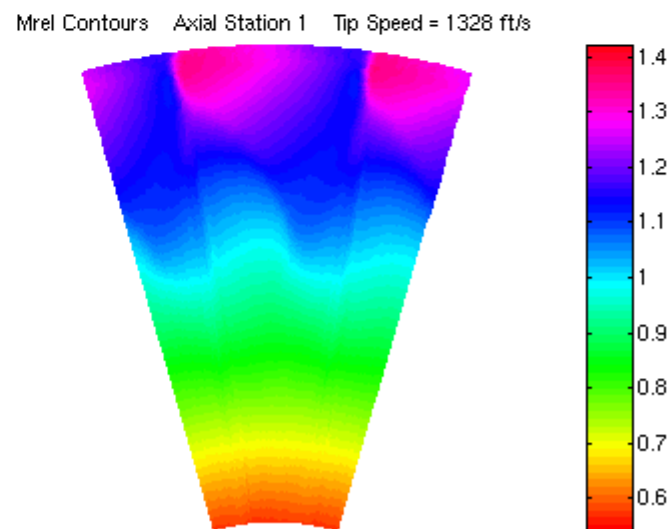
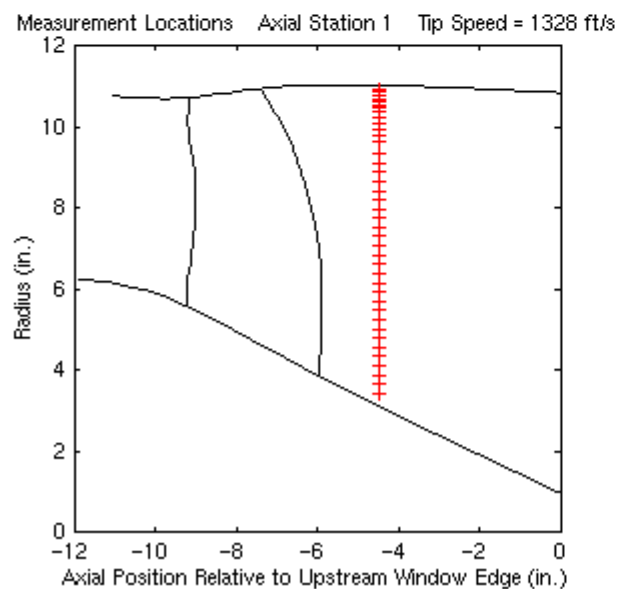
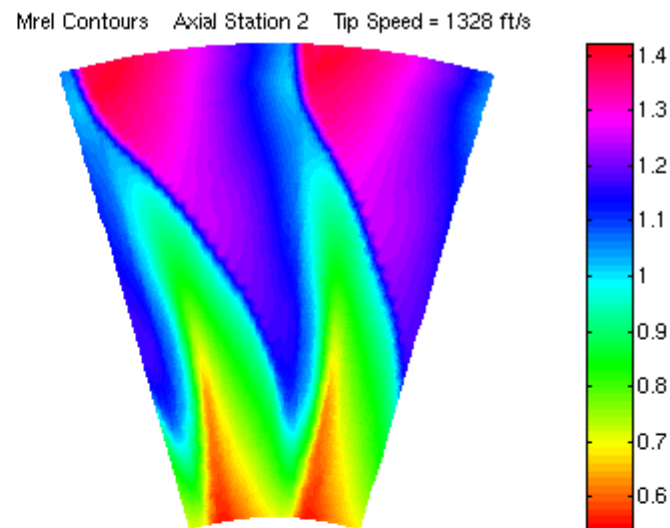
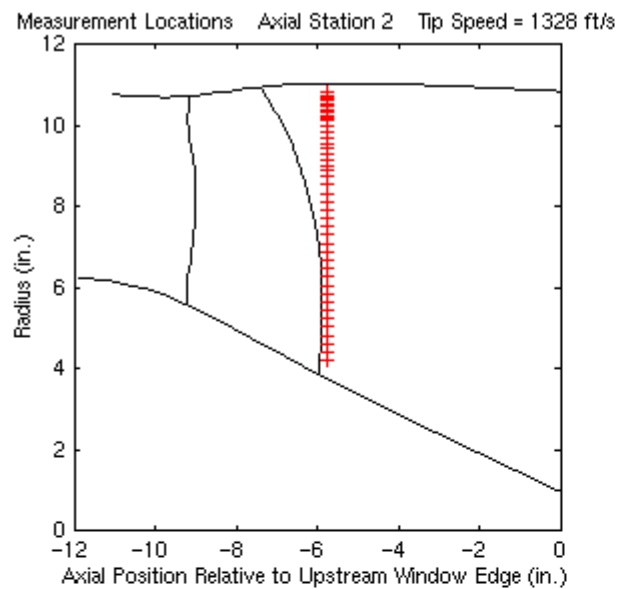


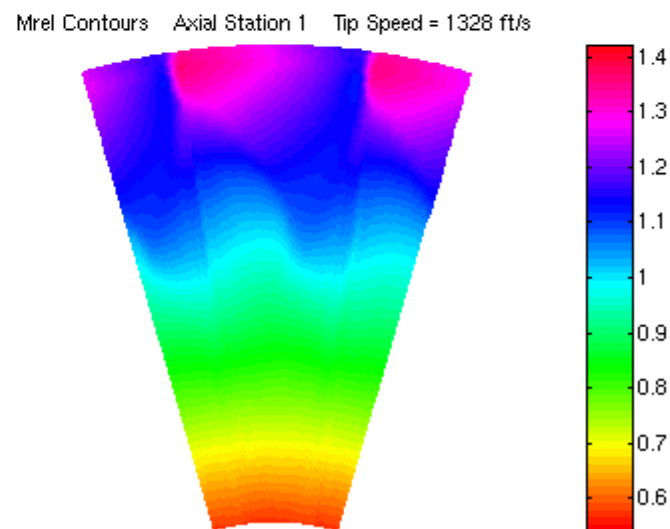
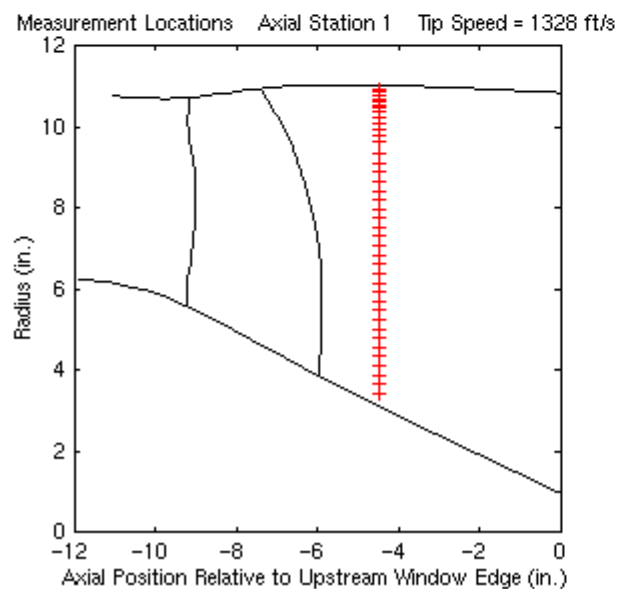
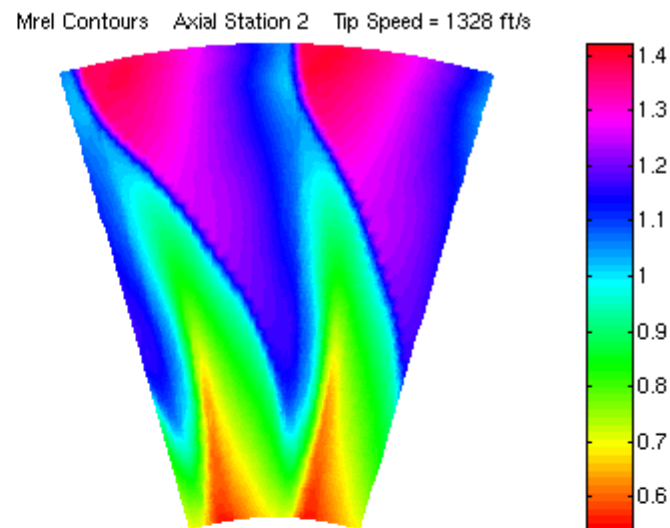
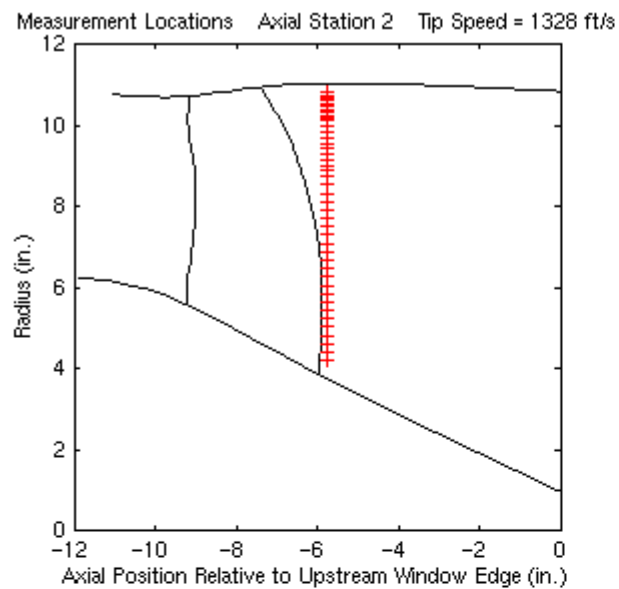


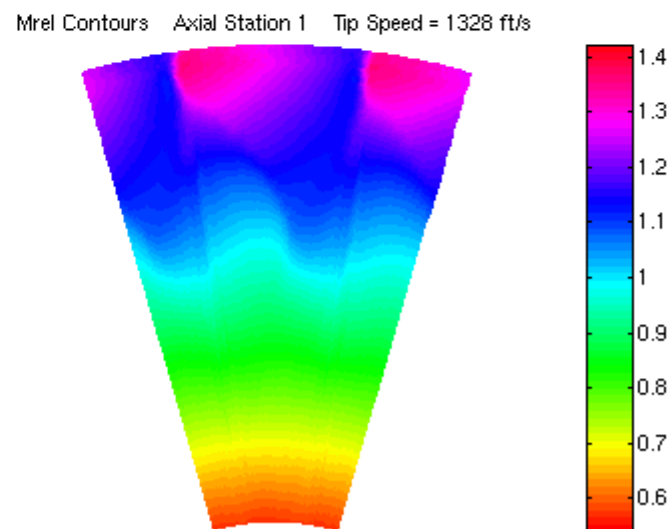
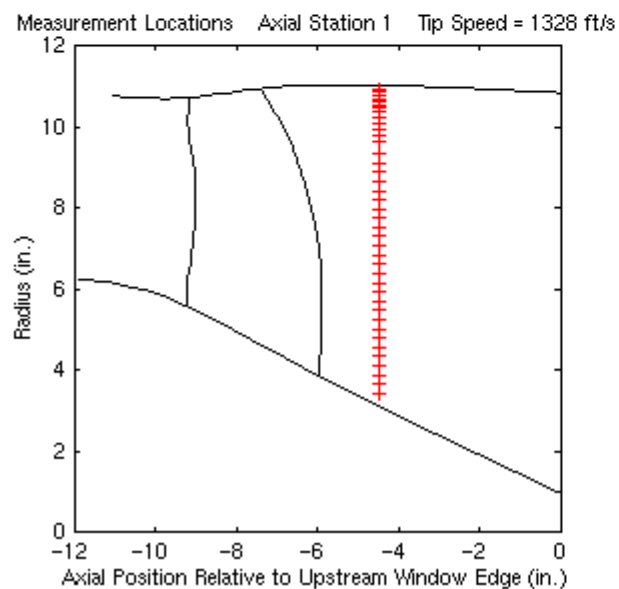
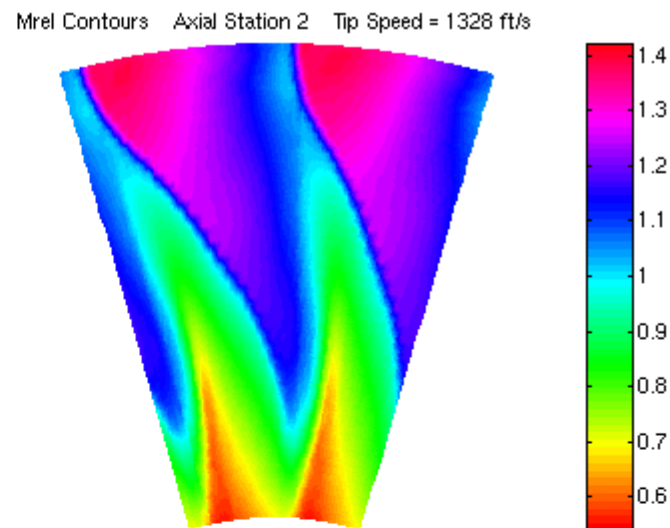
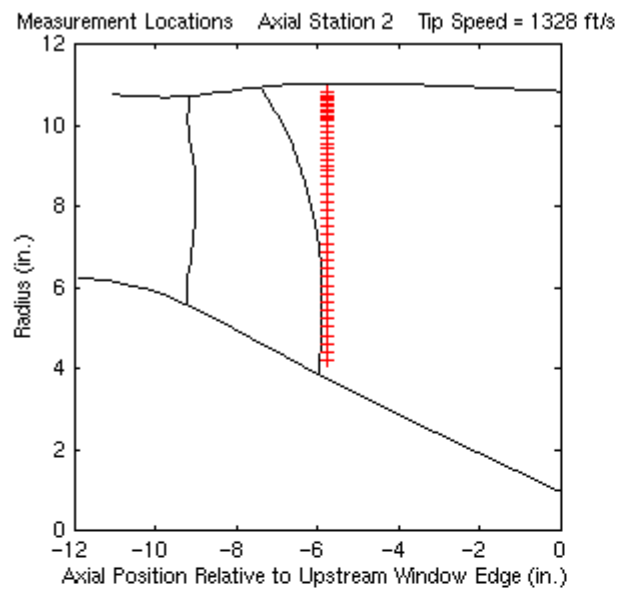


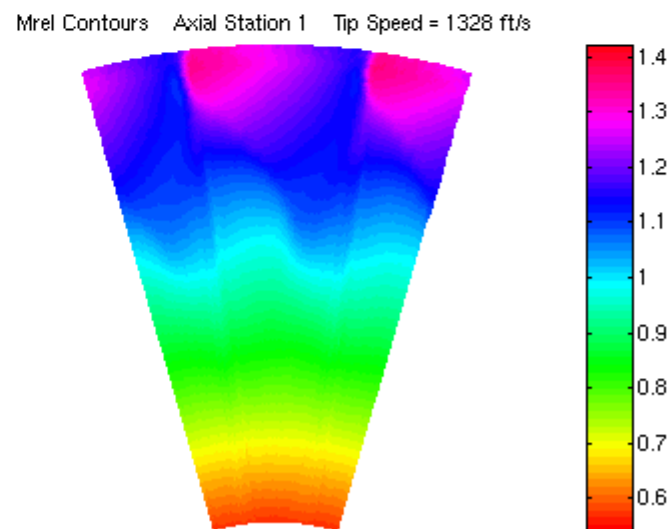
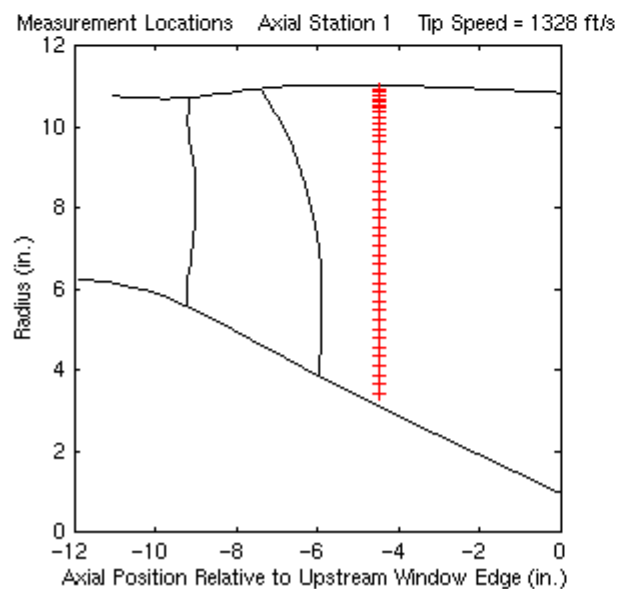
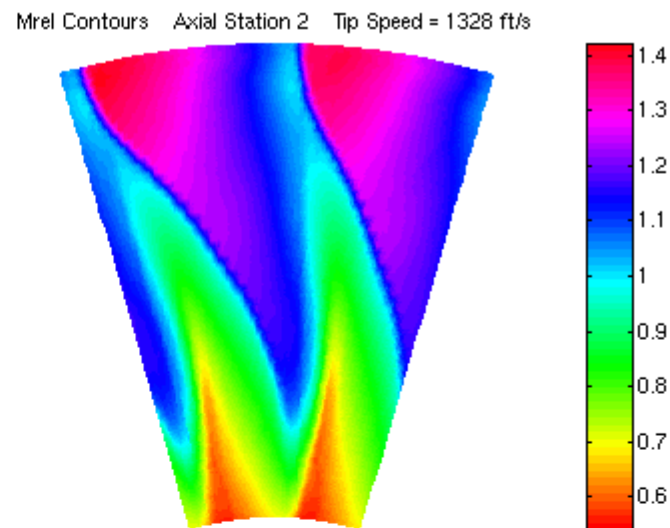
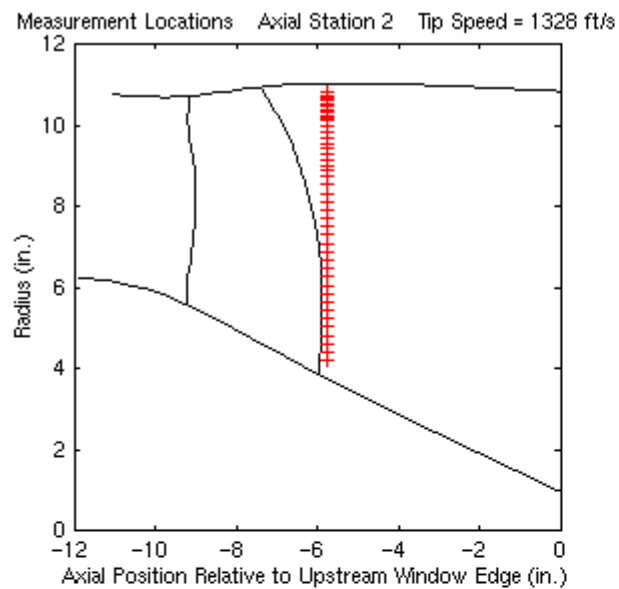












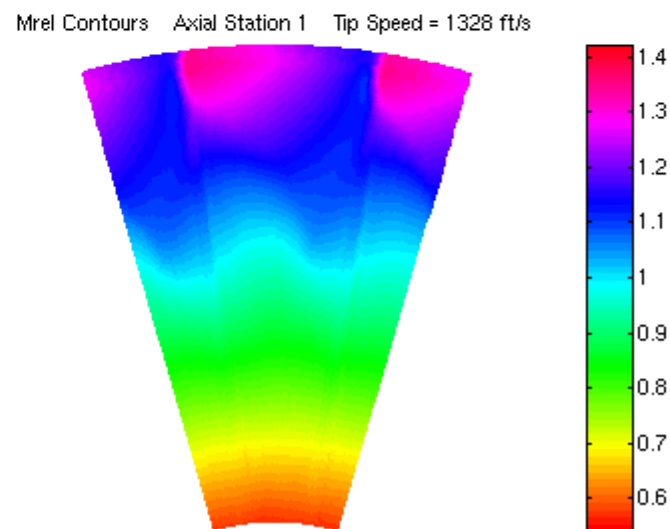
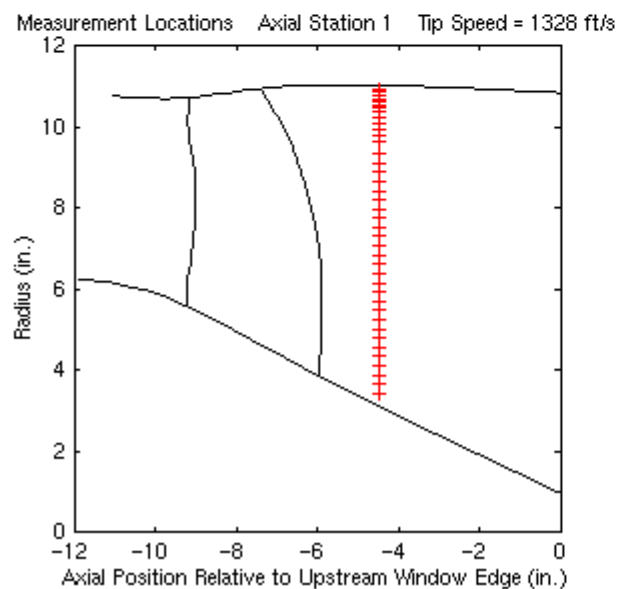
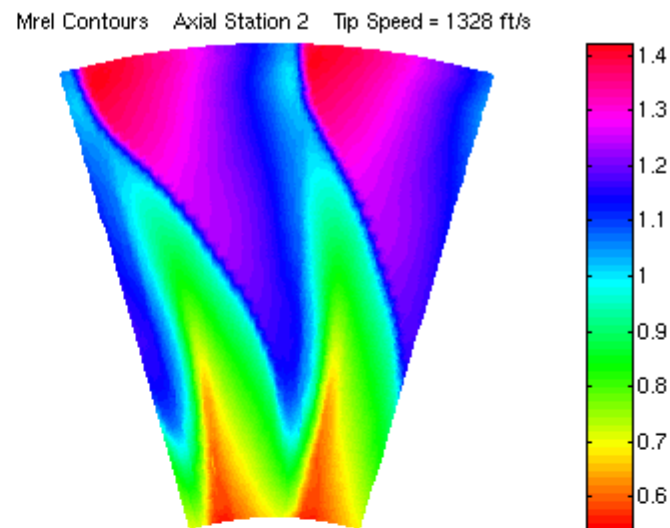
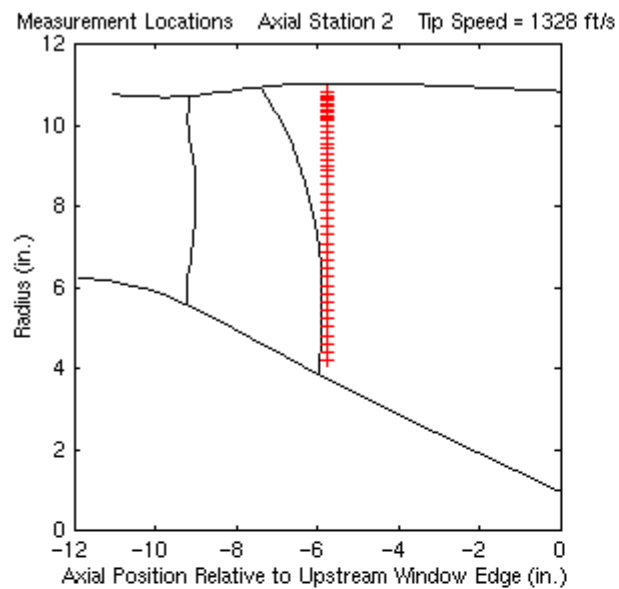
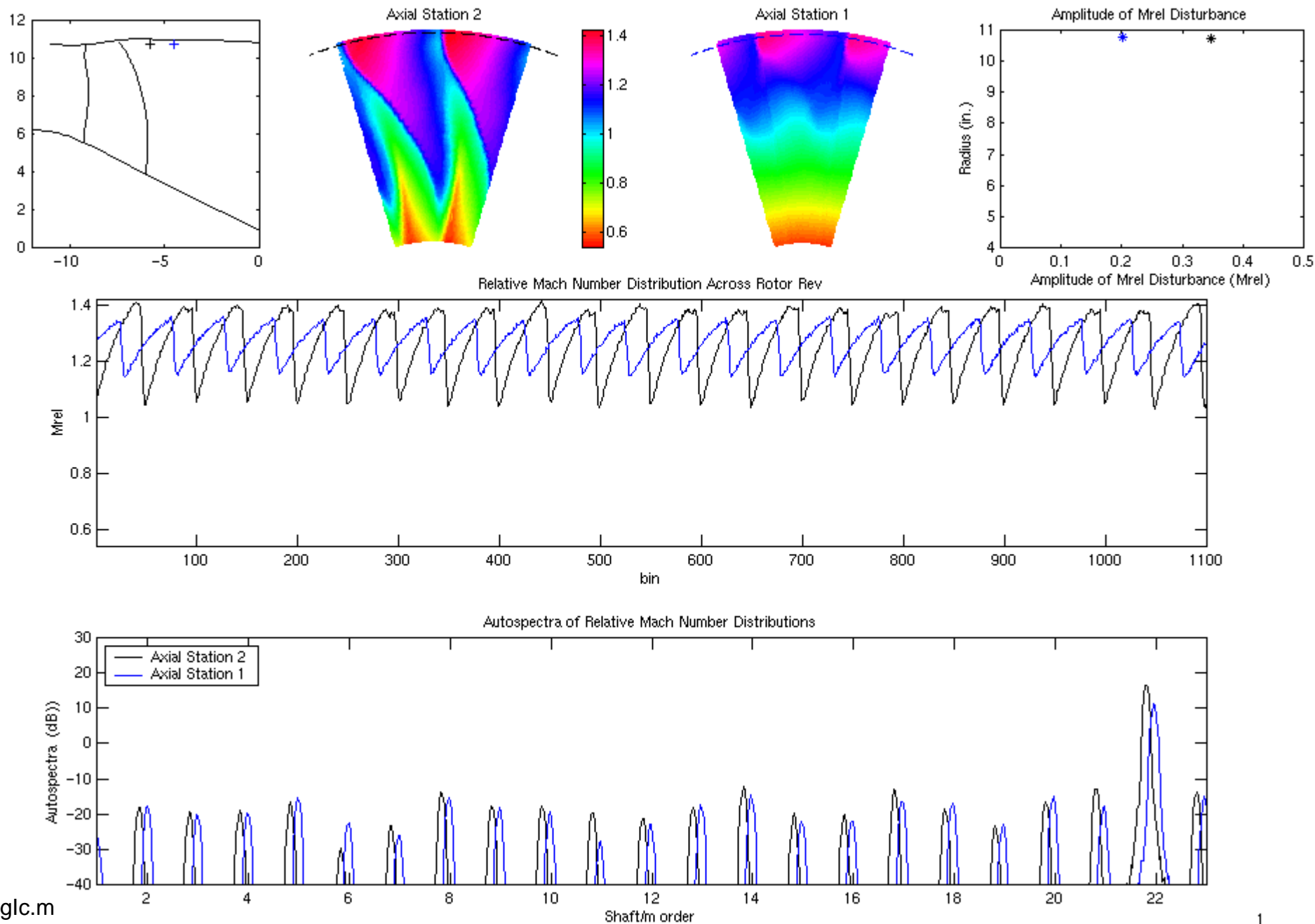
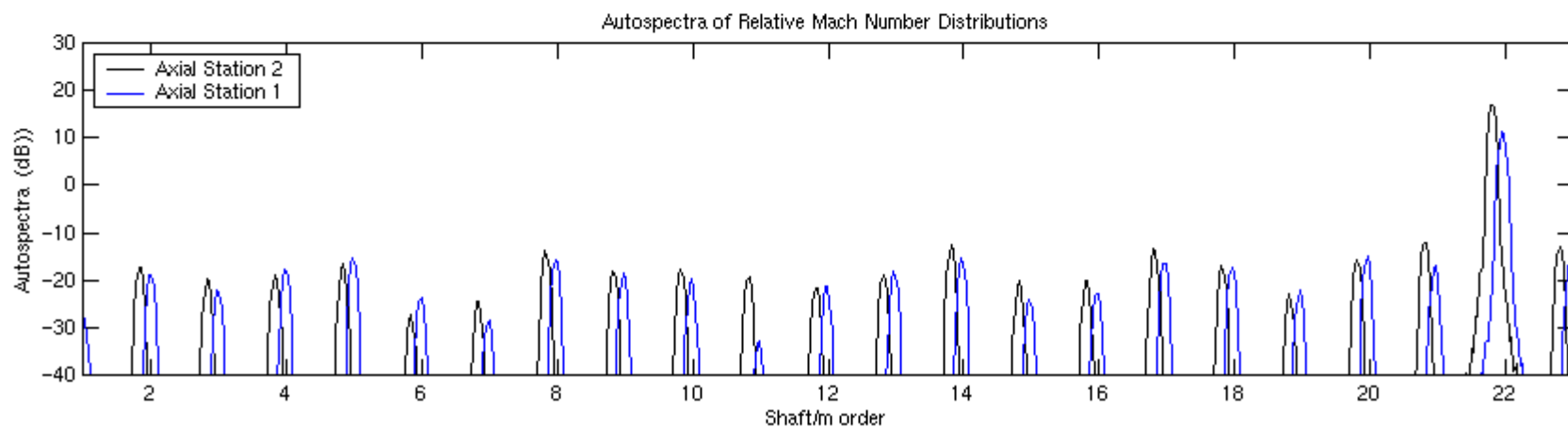
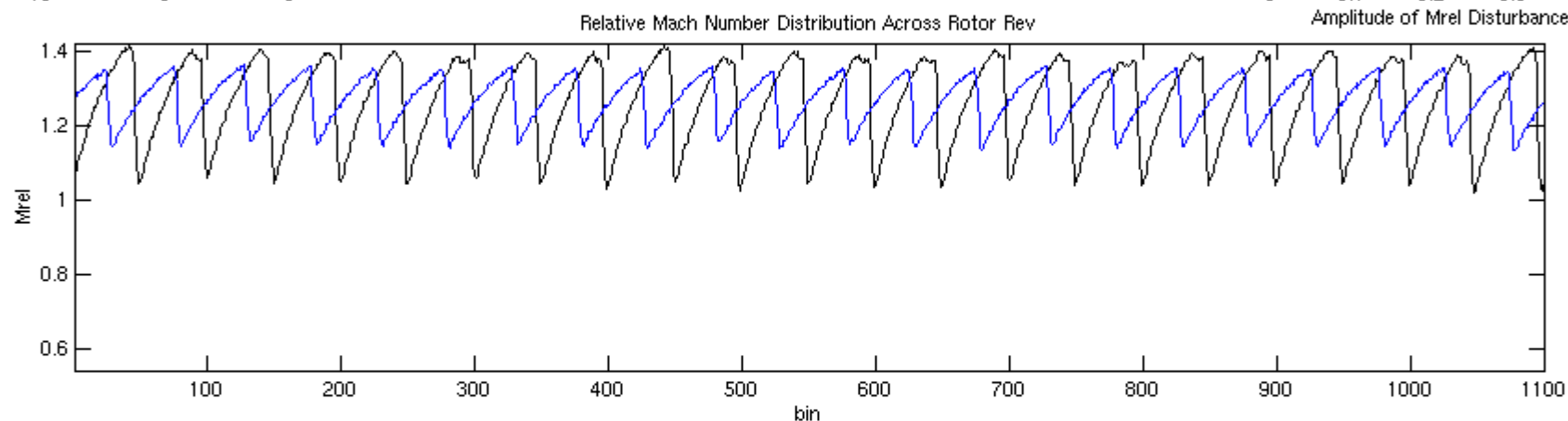
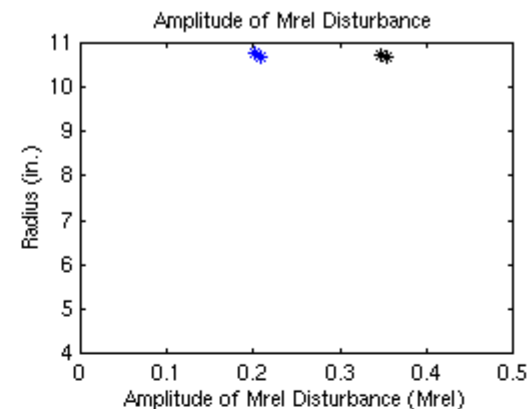
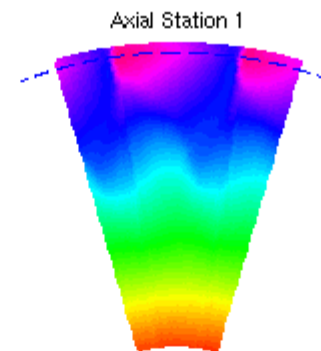
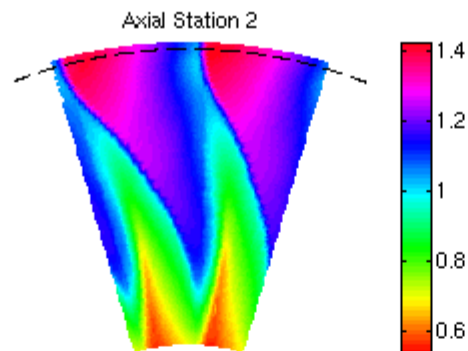
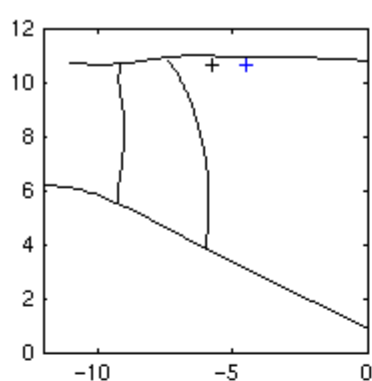
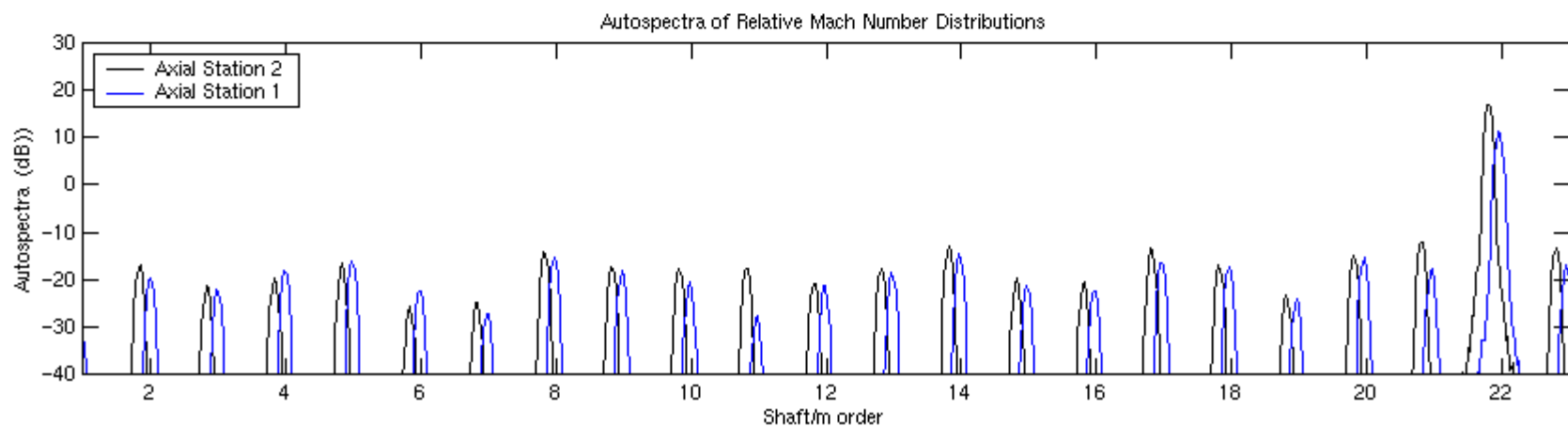
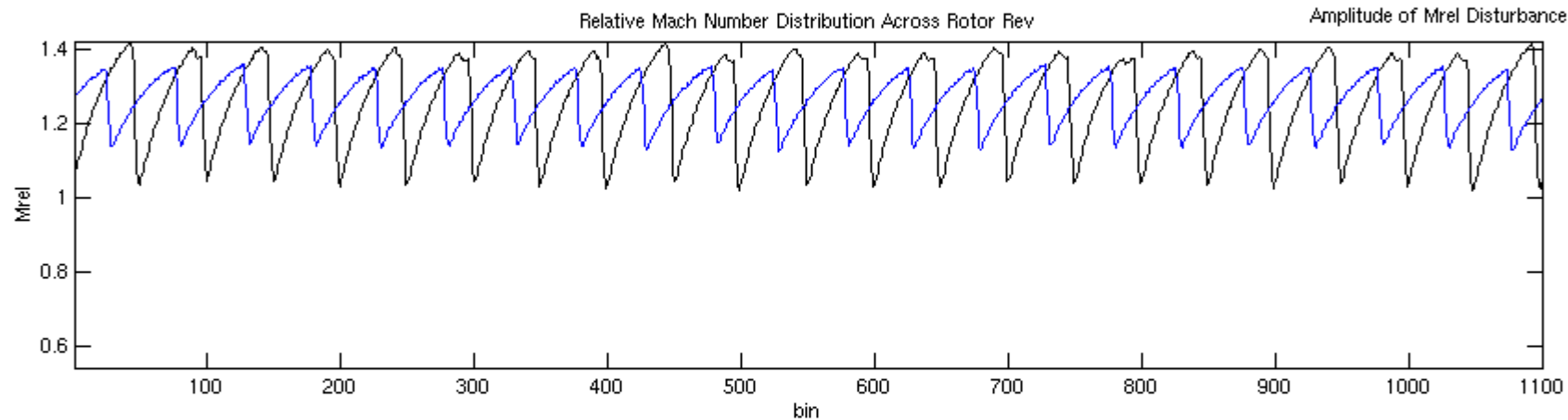
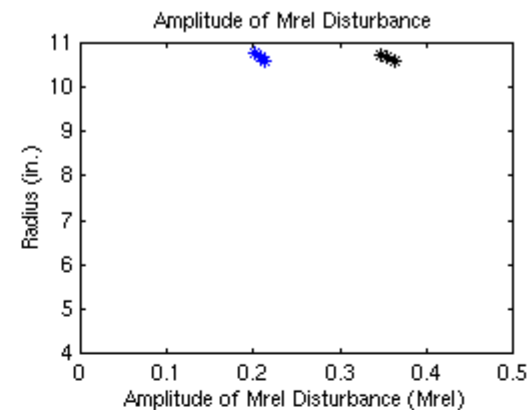
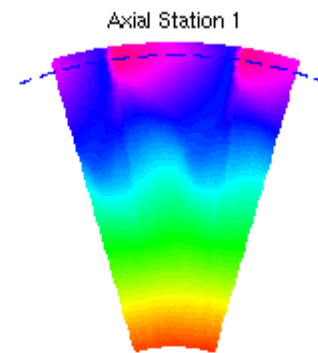
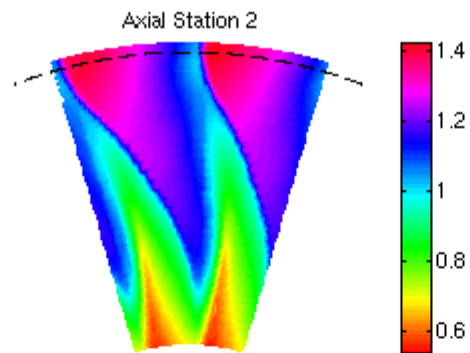
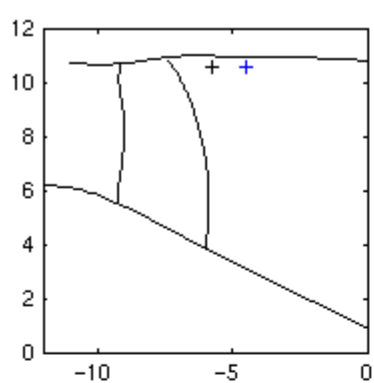
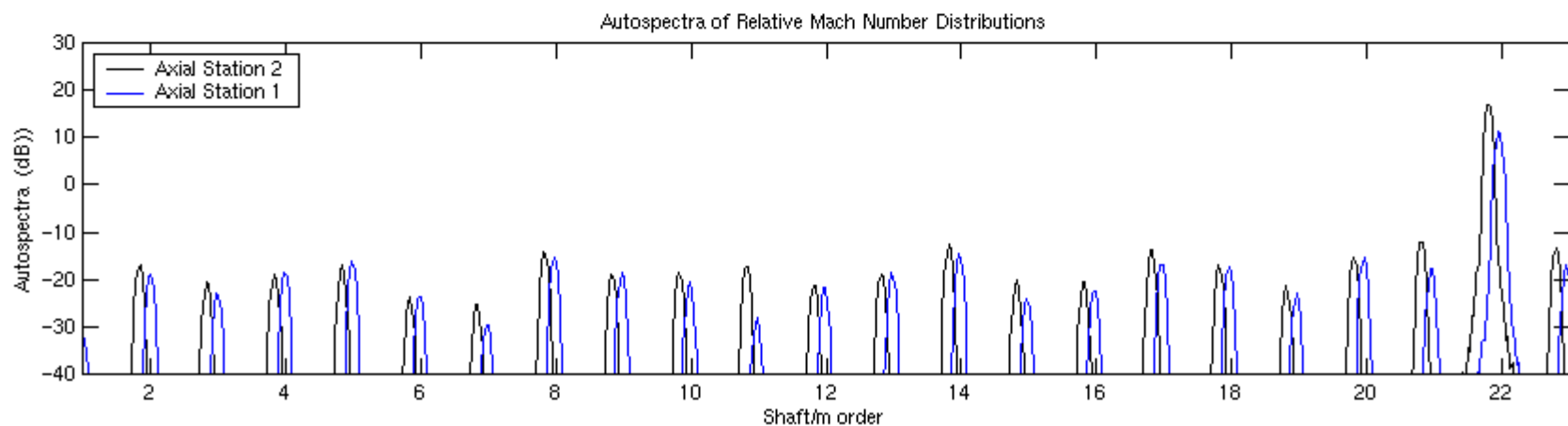
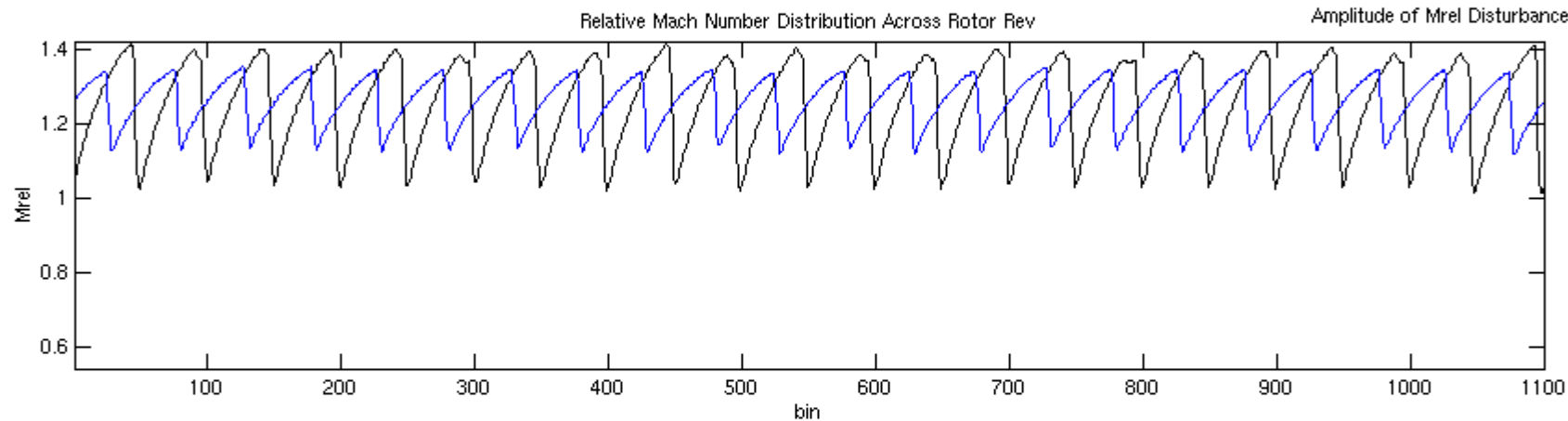
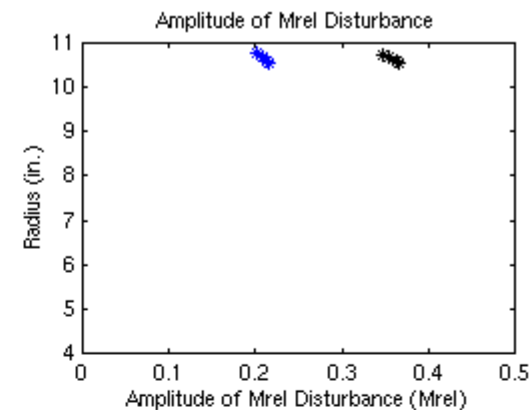
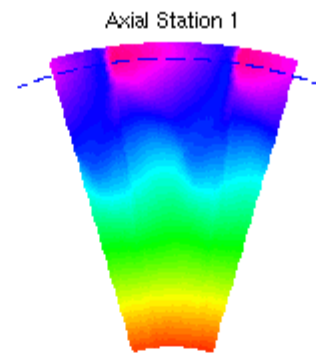
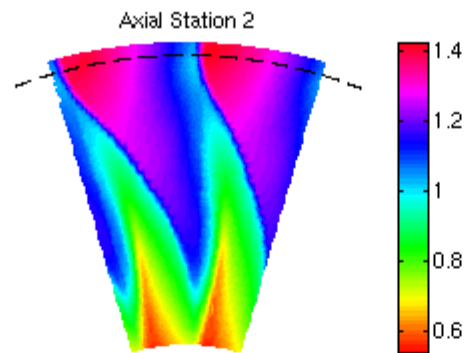
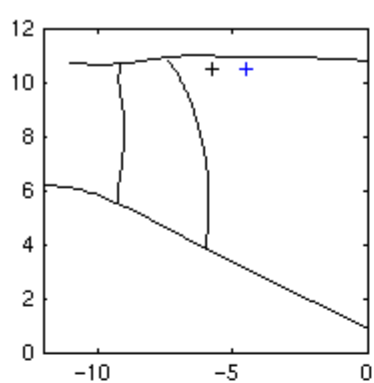


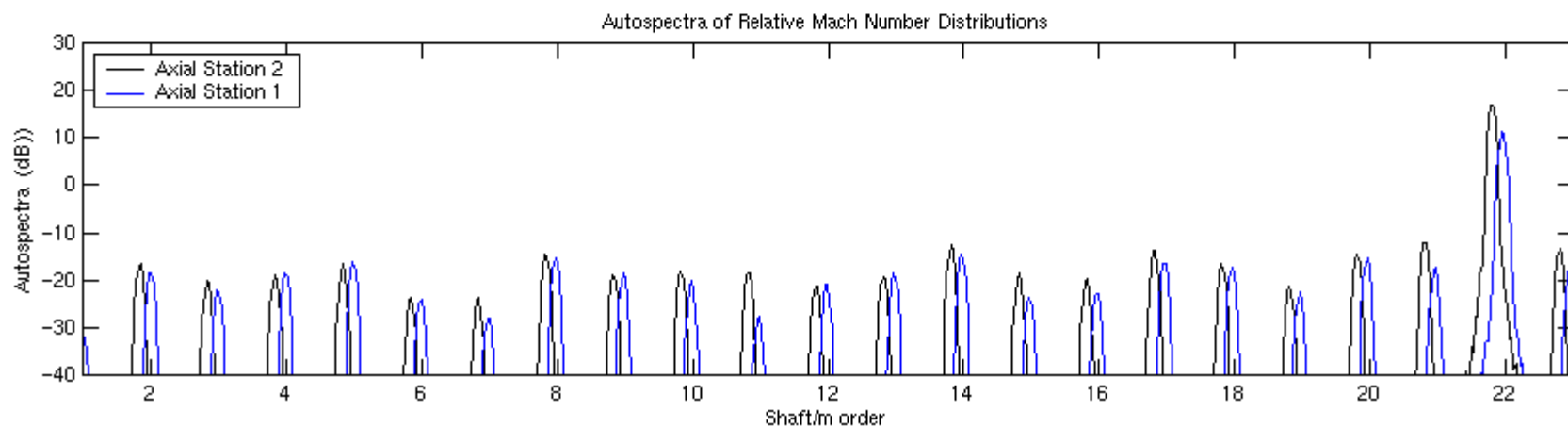
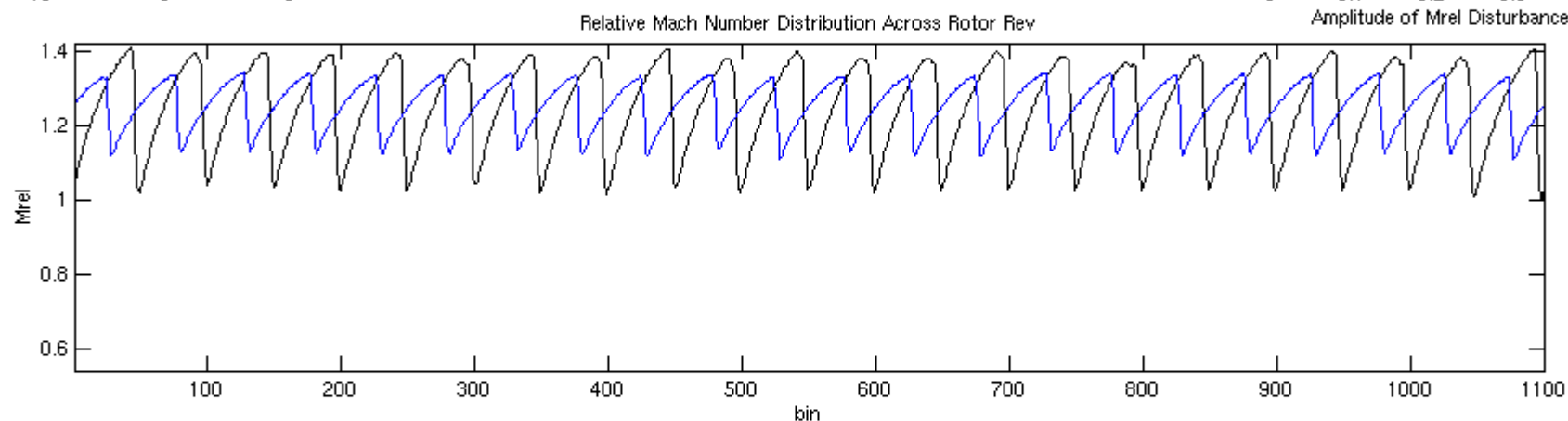
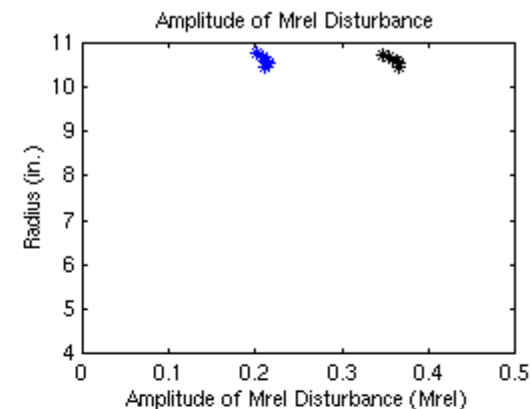
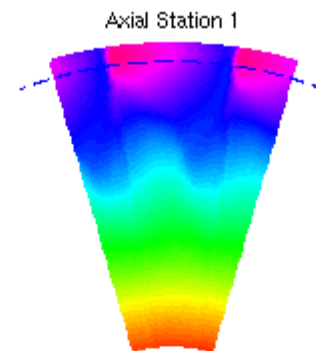
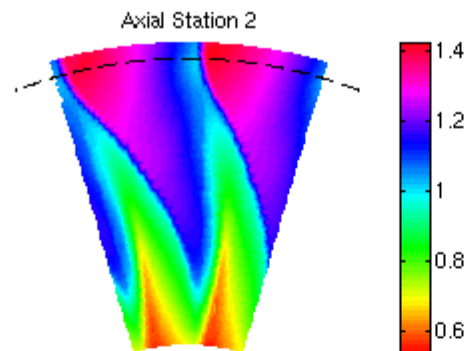
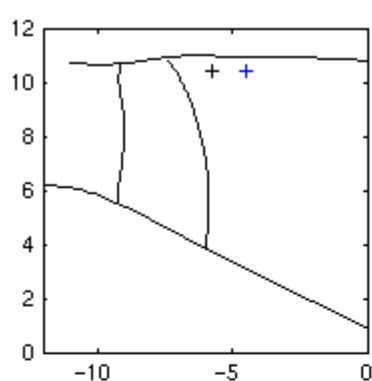
Figure 20.—Slideshow (35 slides) illustrating how the perturbation in the flow measured at axial stations 1 and 2 upstream of the aft-swept fan varies with radial location at the high-speed condition. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows autospectra computed from the relative Mach number distributions ($m = 22$ corresponds to the blade passing frequency). The plot in the upper right-hand corner shows the average amplitude of the relative Mach number distributions (plotted along the x-axis) vs. radial location (plotted along the y-axis). The dashed lines overlaid on top of the color contour plots show the radial locations at which the data presented on that slide were acquired.

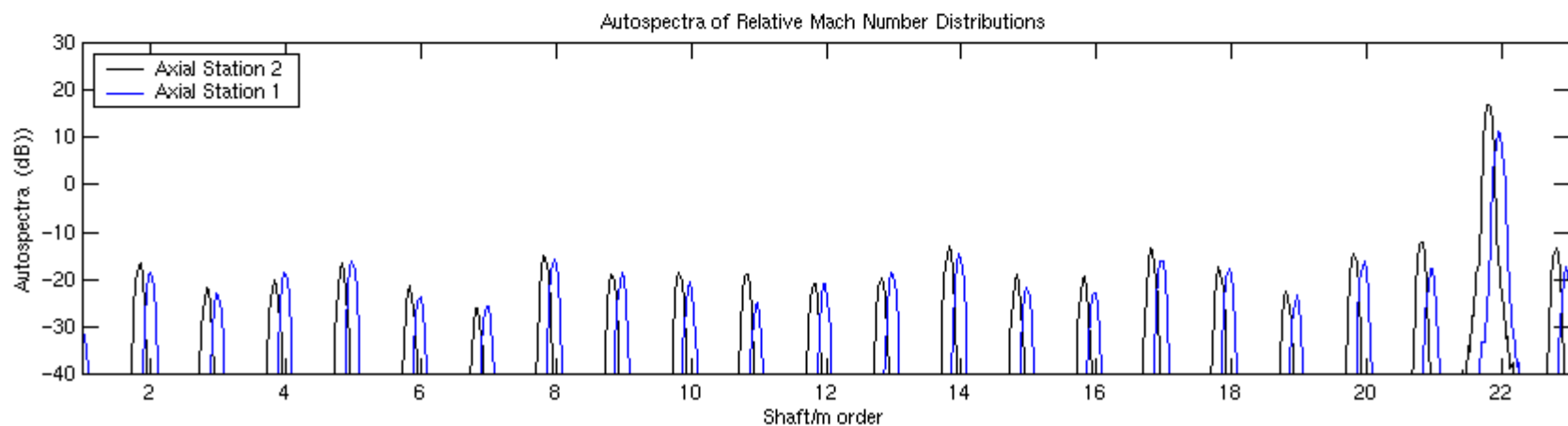
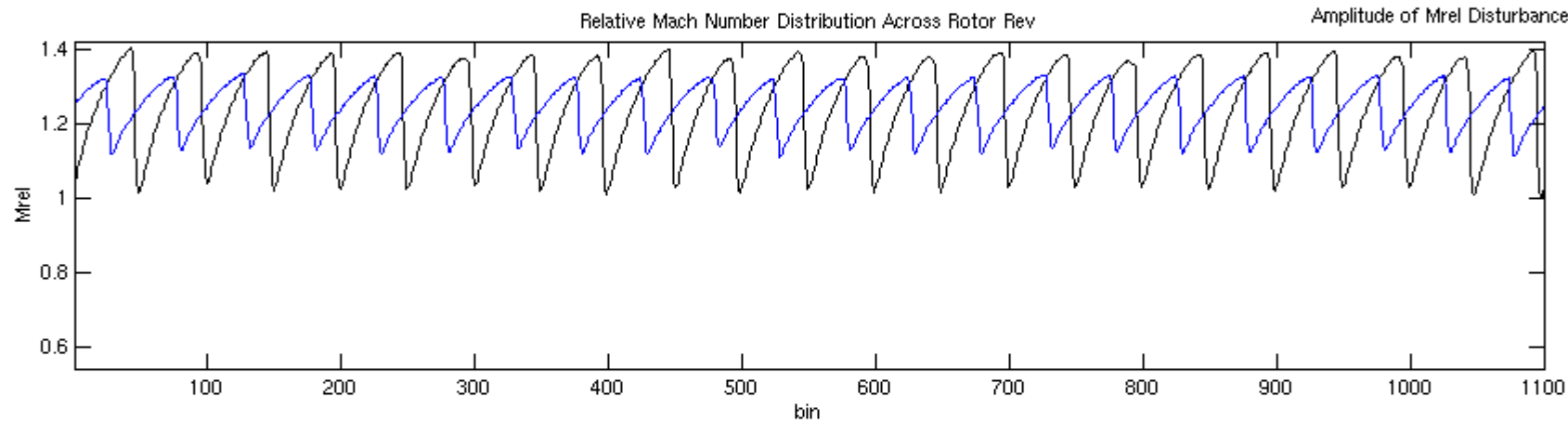
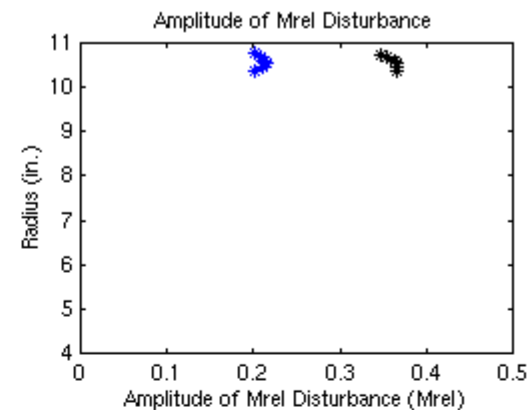
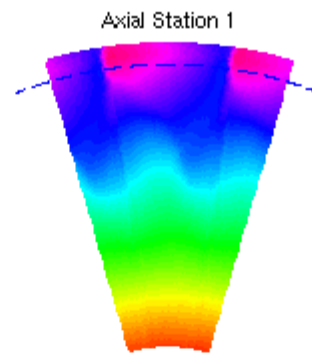
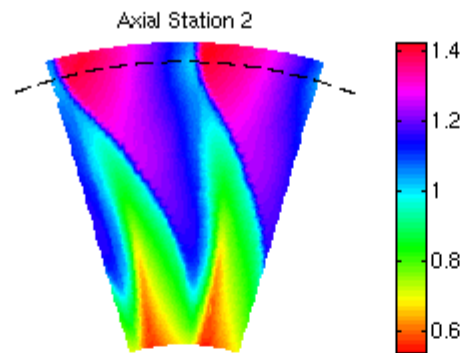
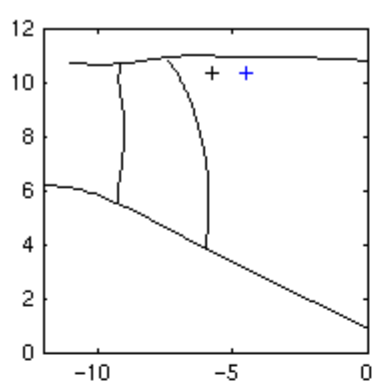


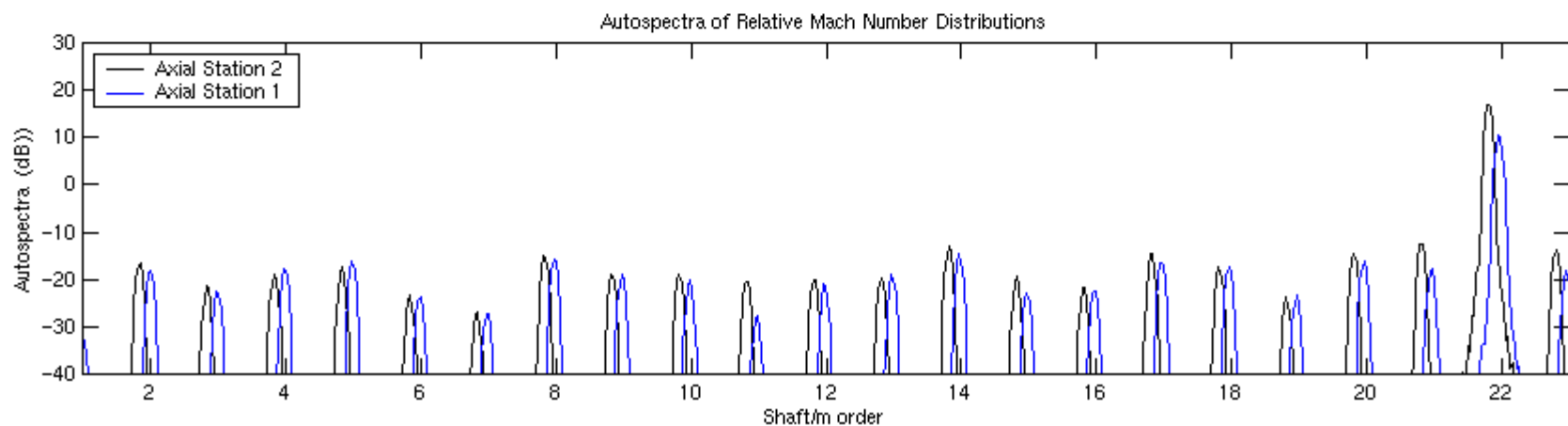
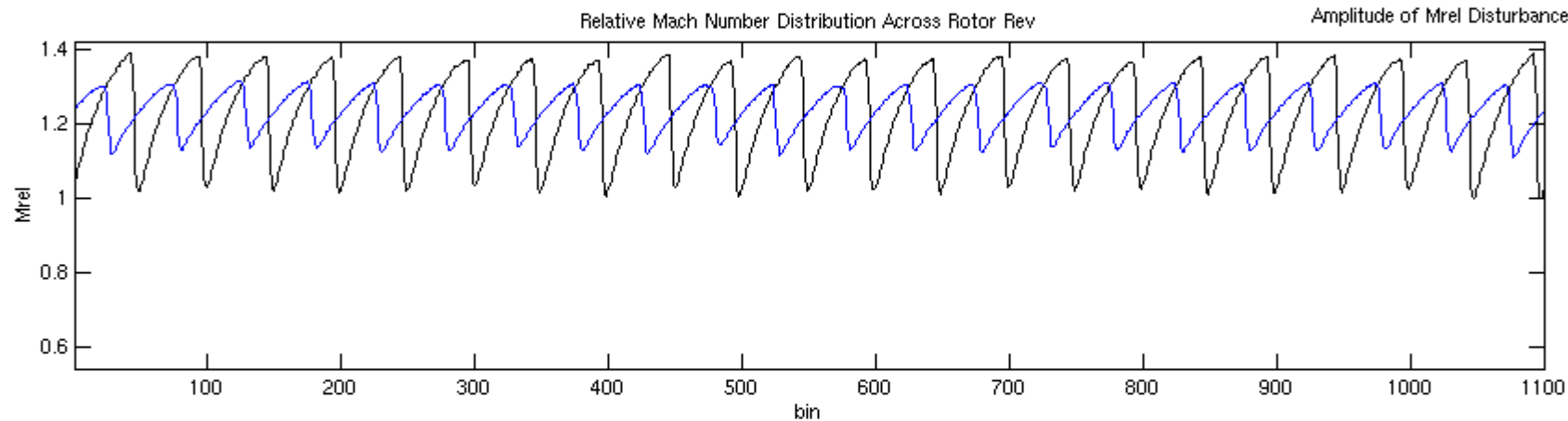
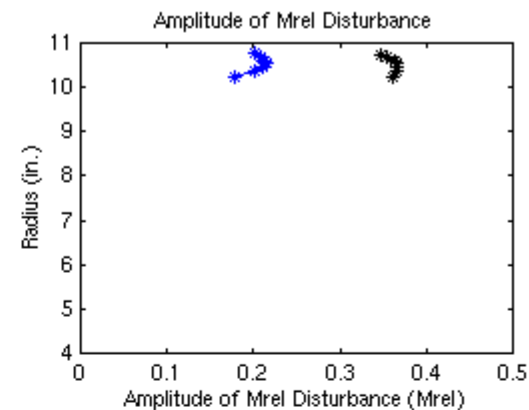
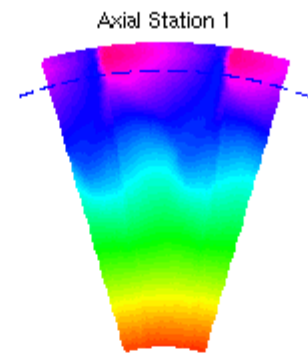
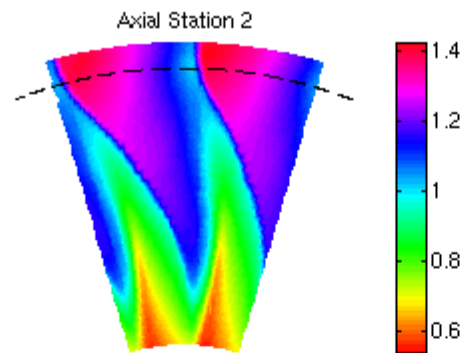
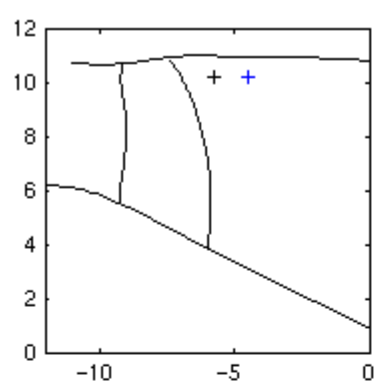


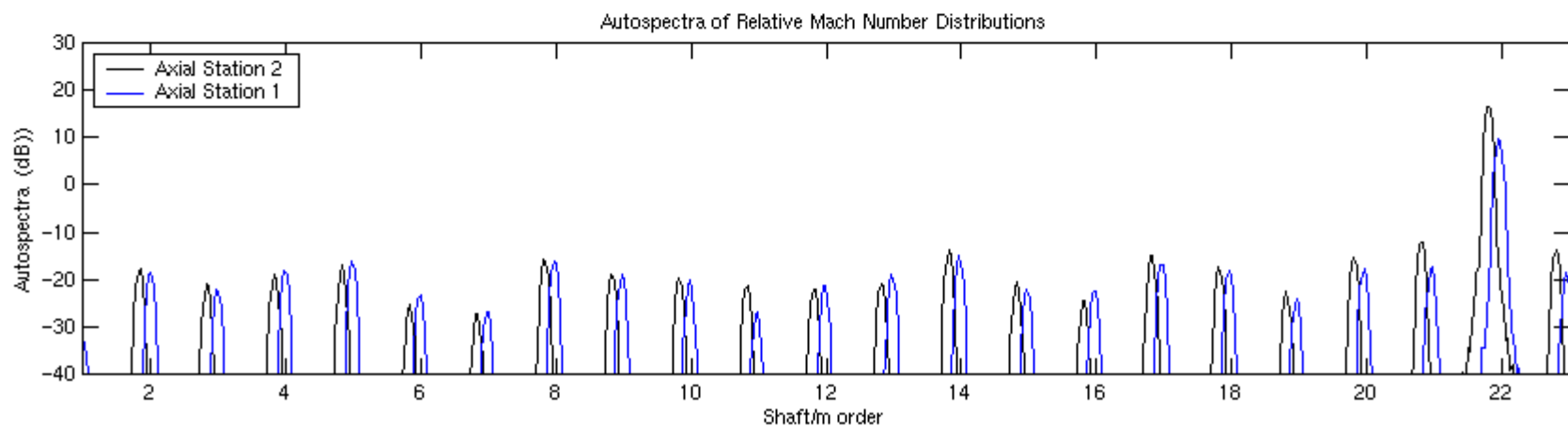
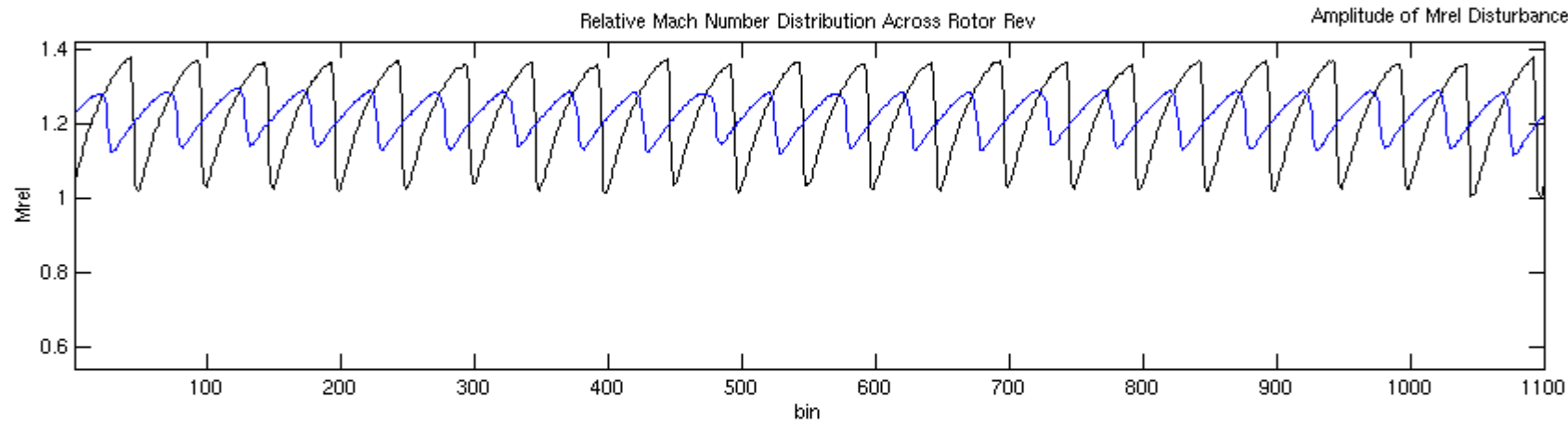
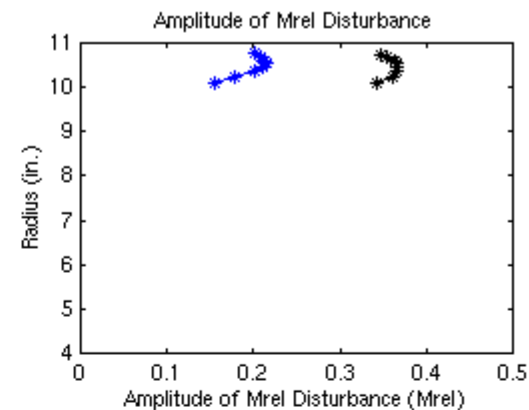
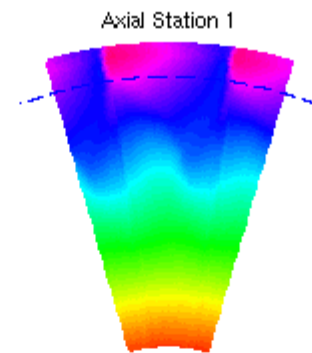
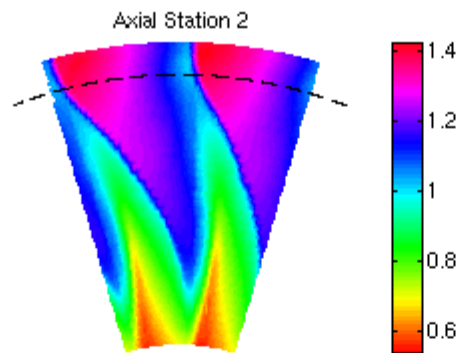
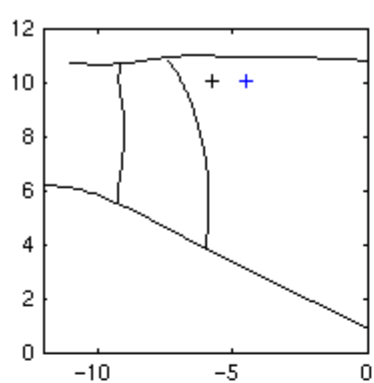


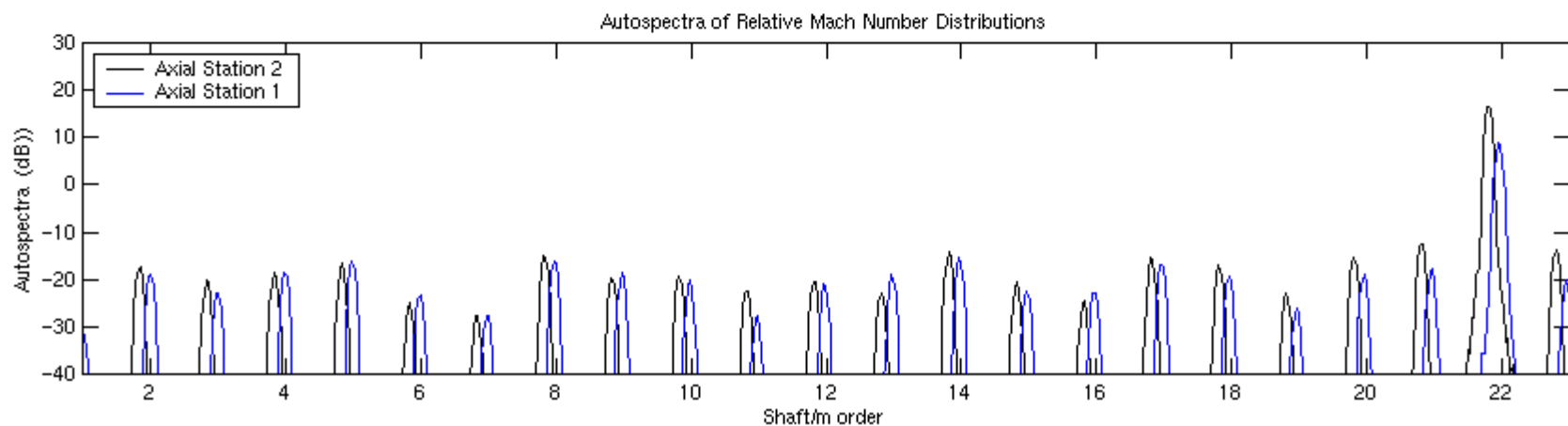
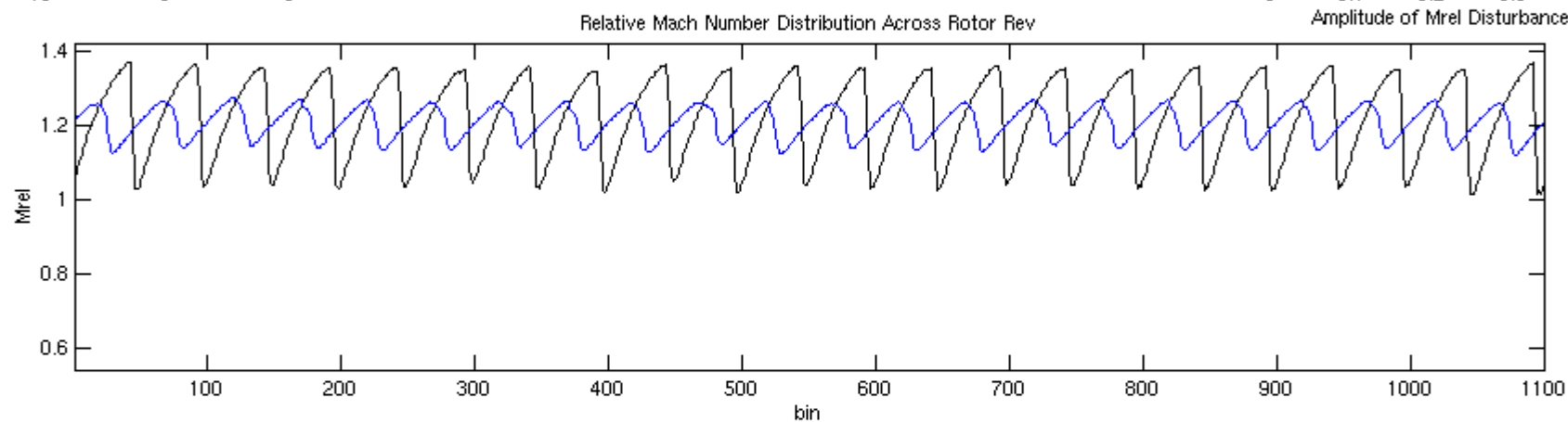
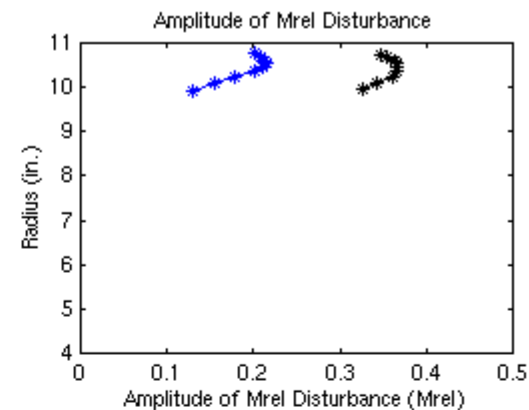
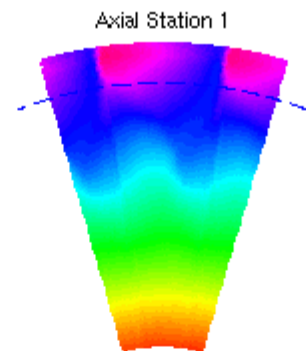
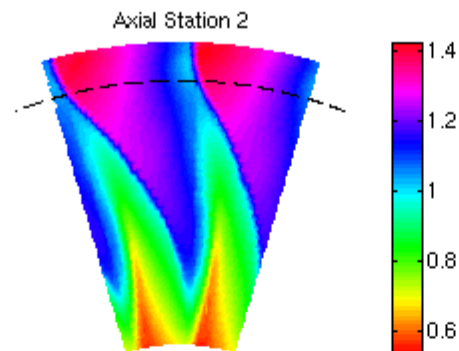
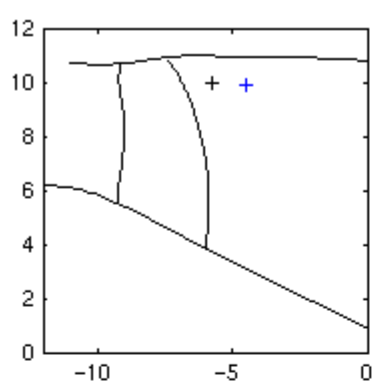


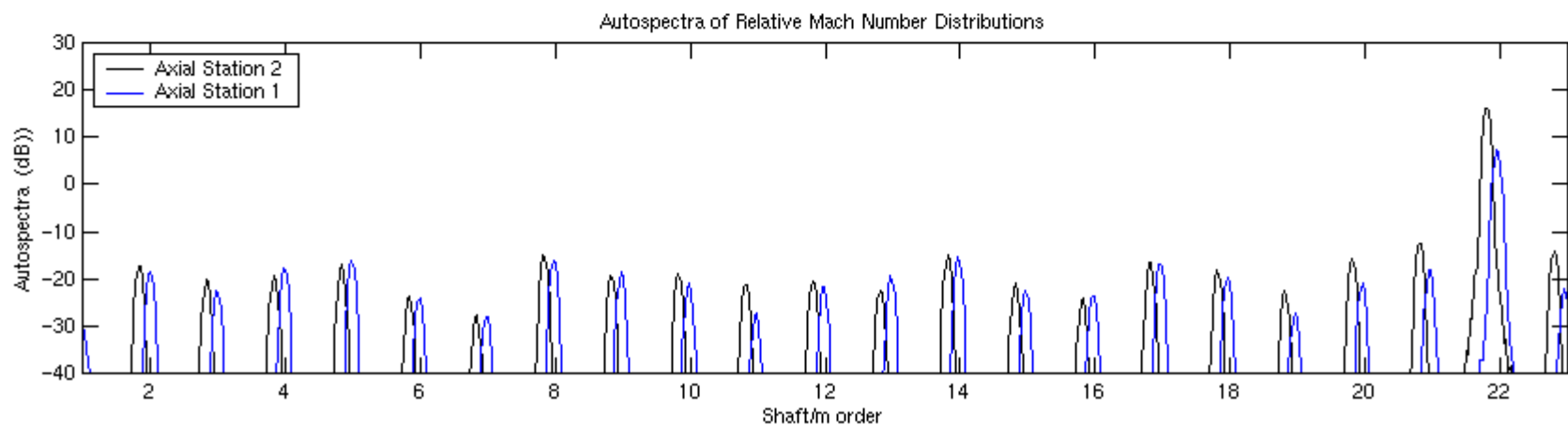
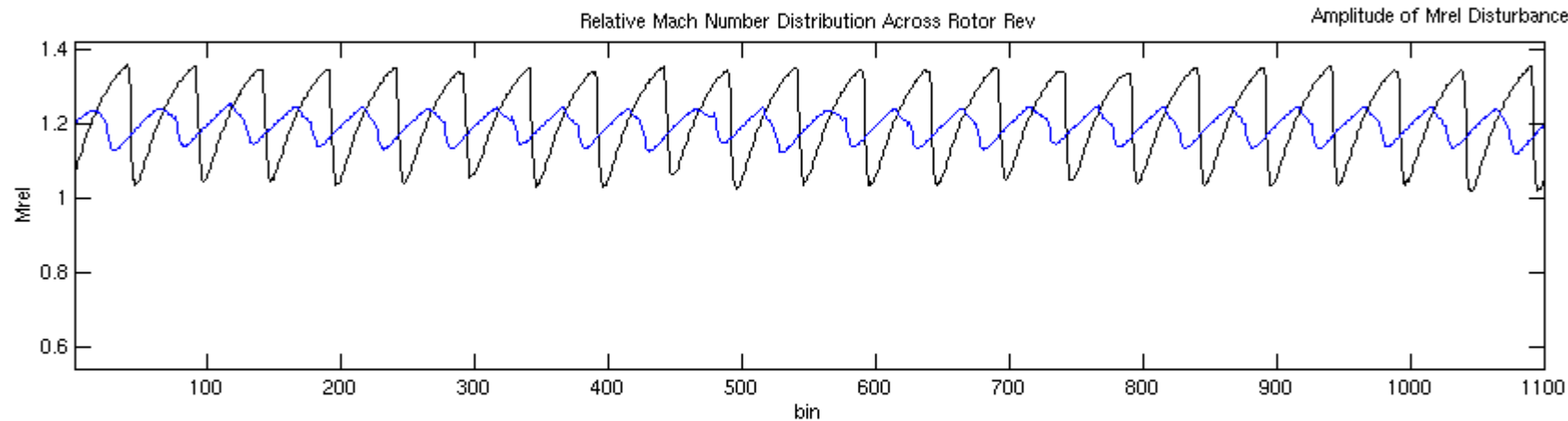
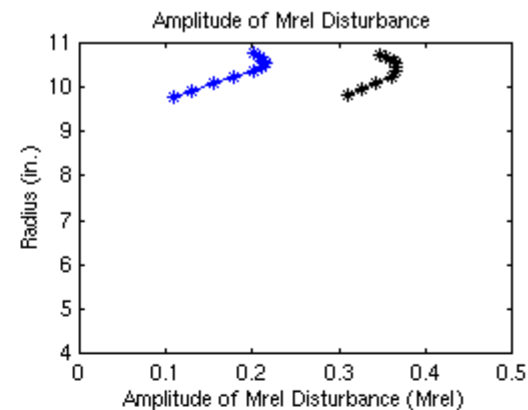
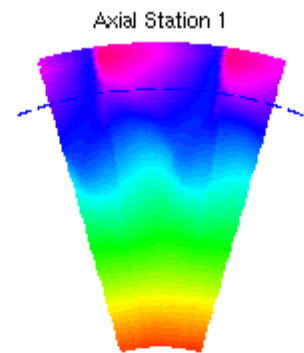
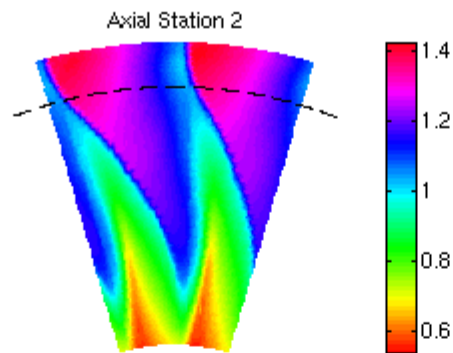
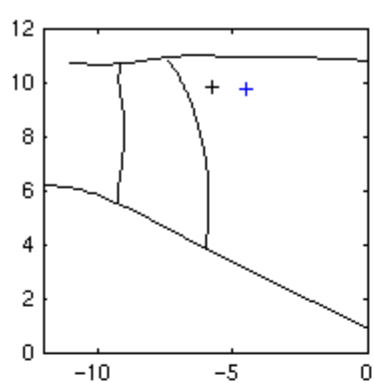


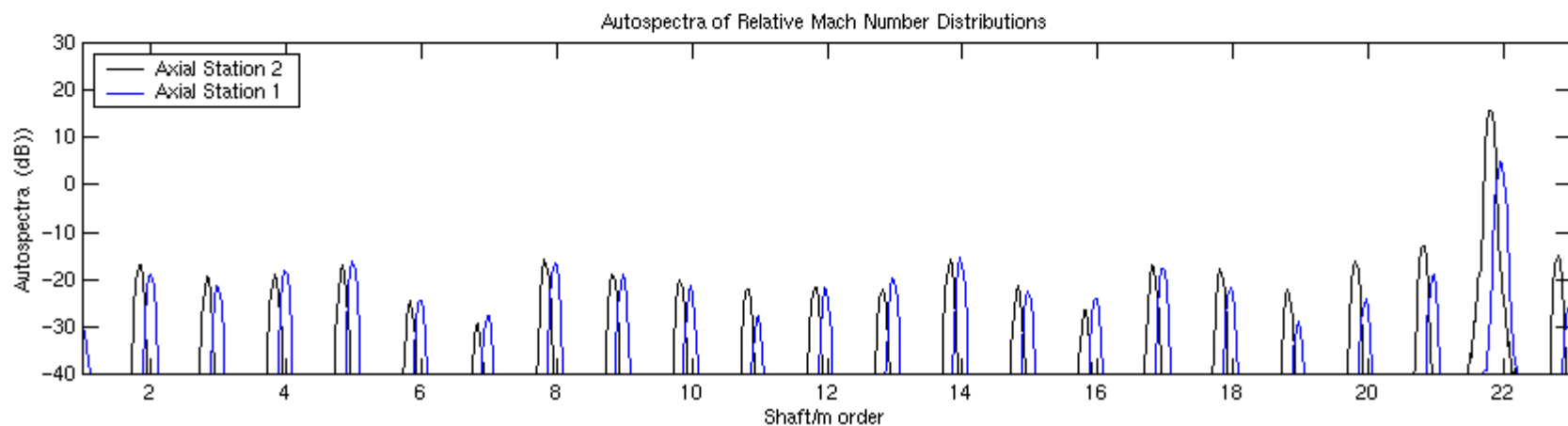
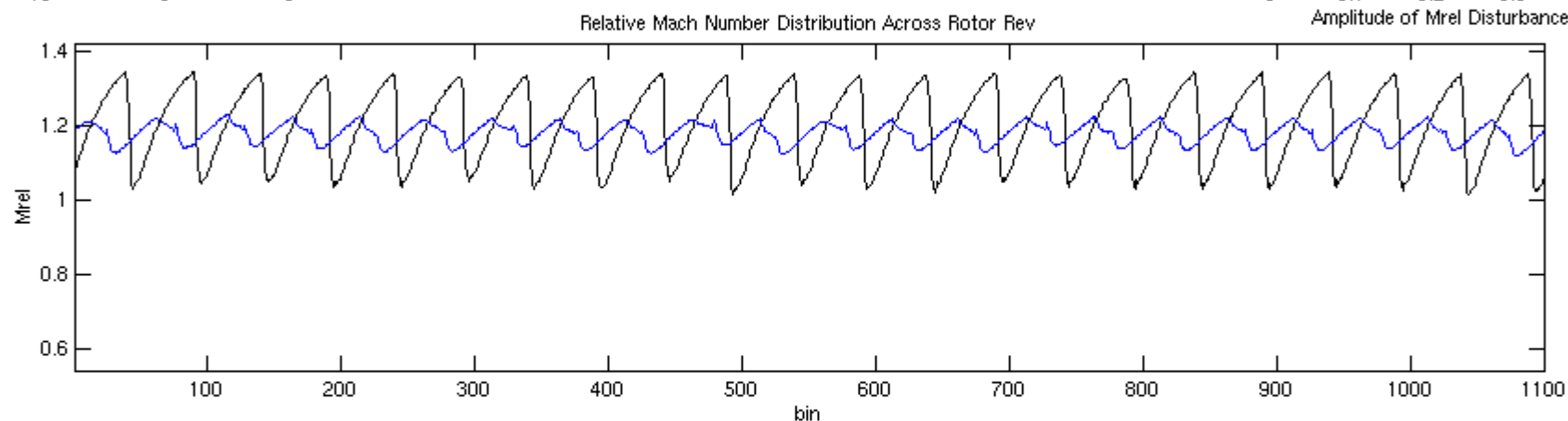
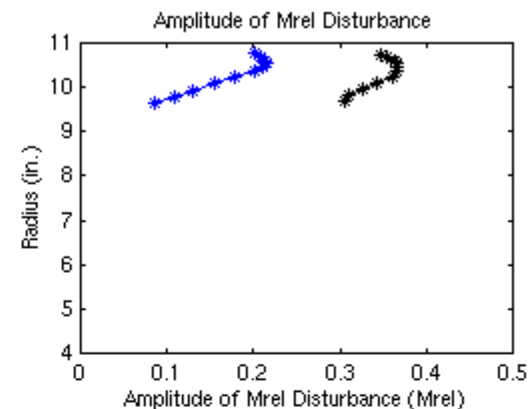
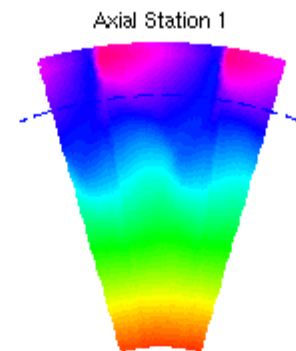
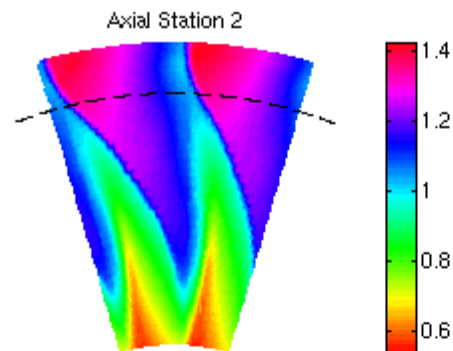
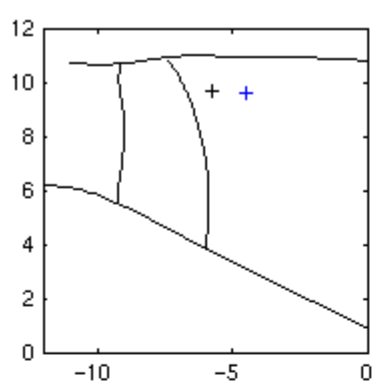


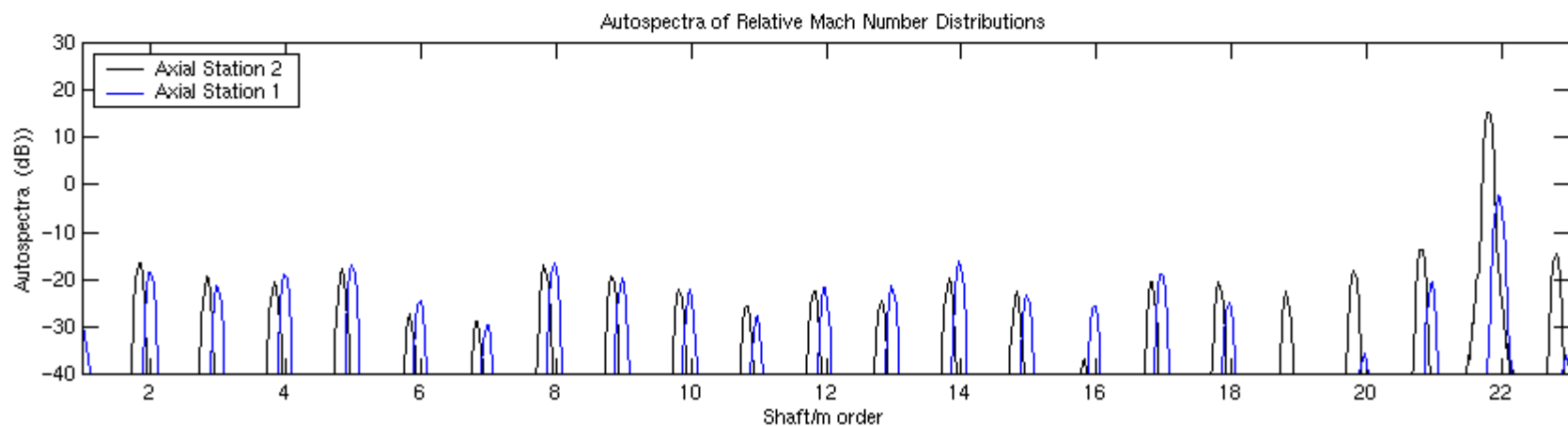
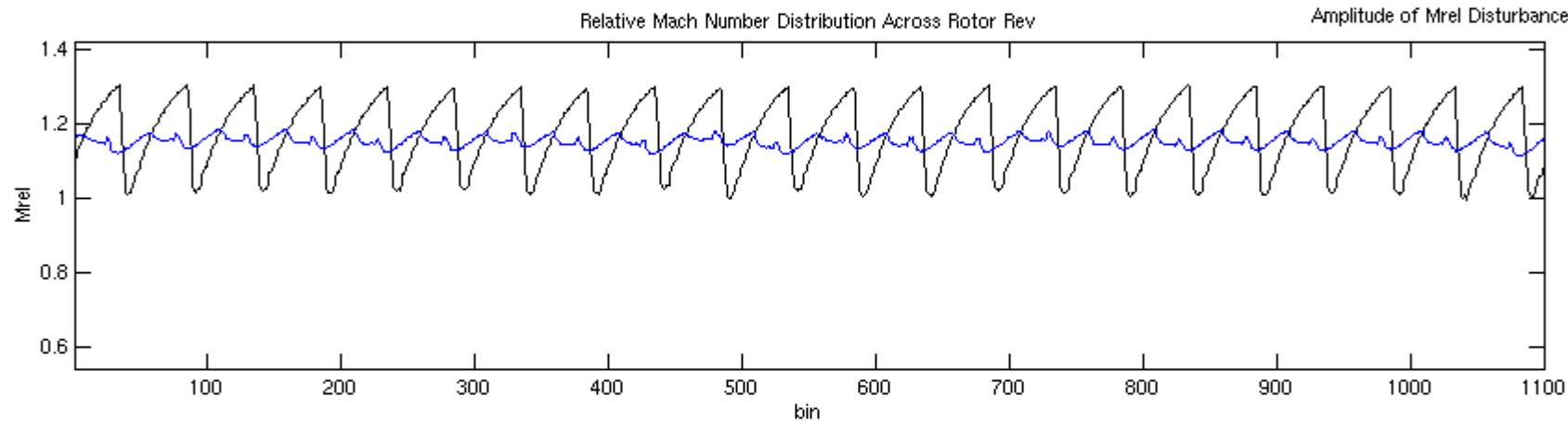
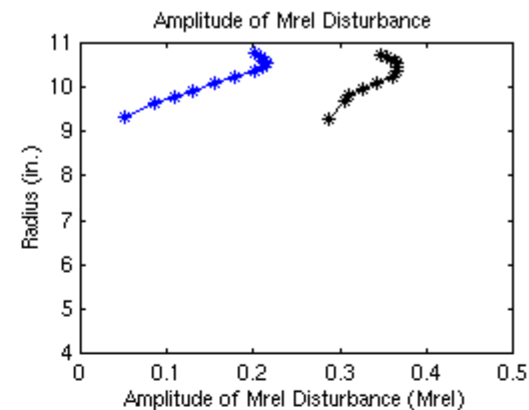
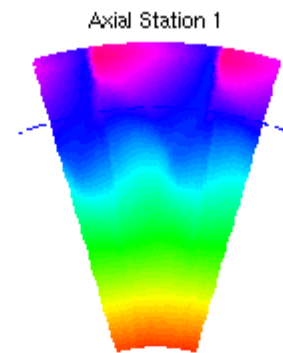
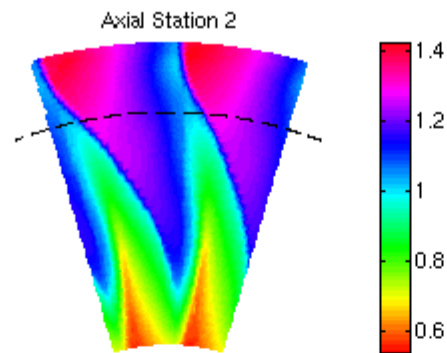
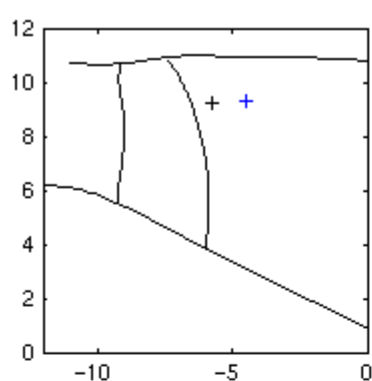


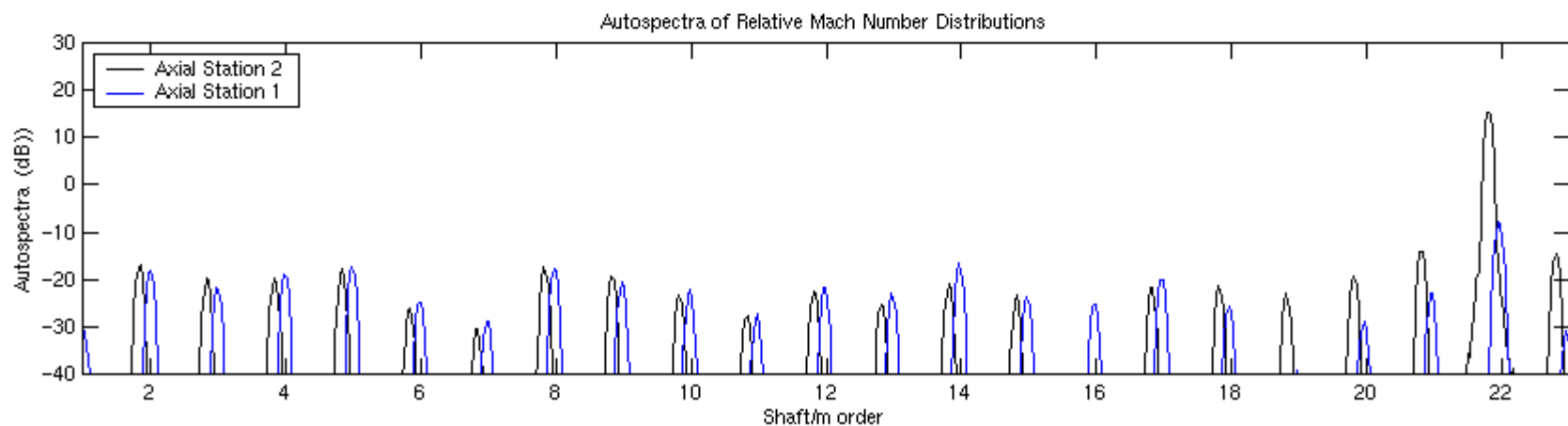
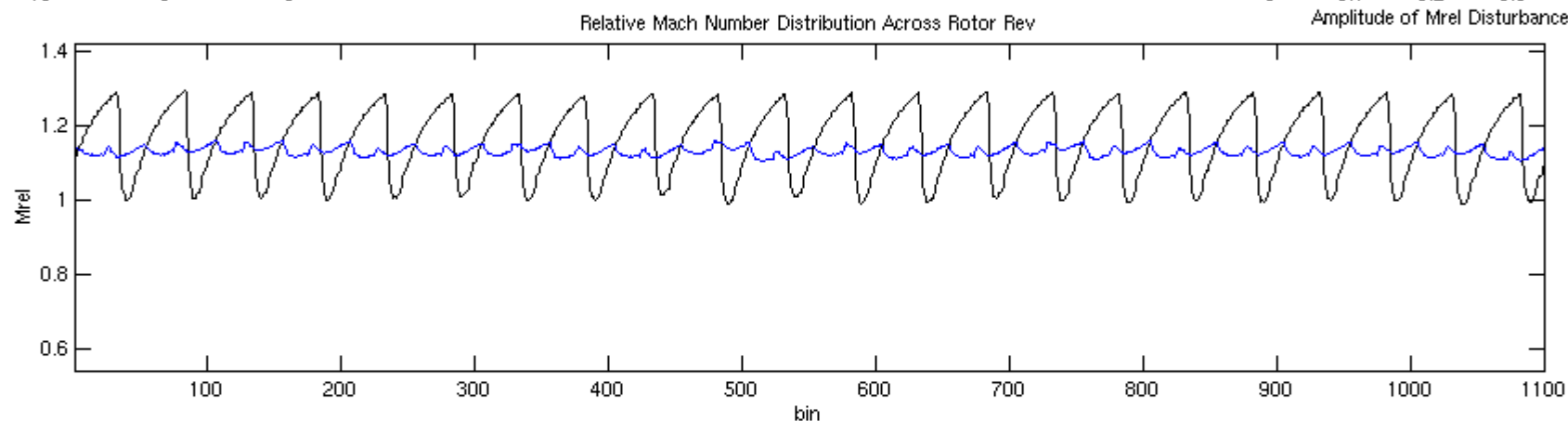
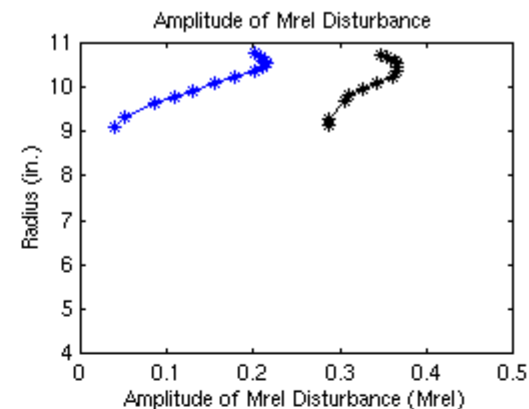
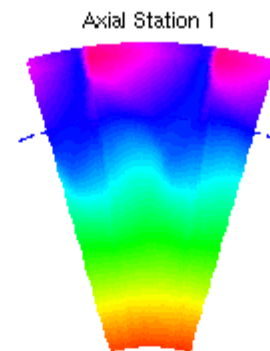
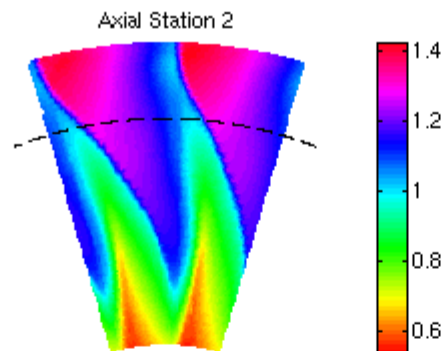
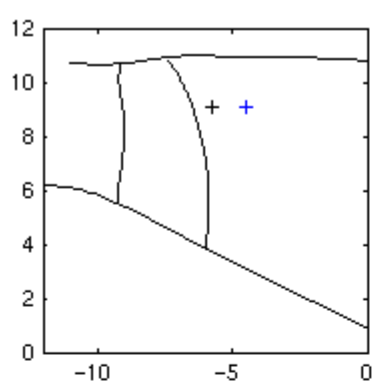


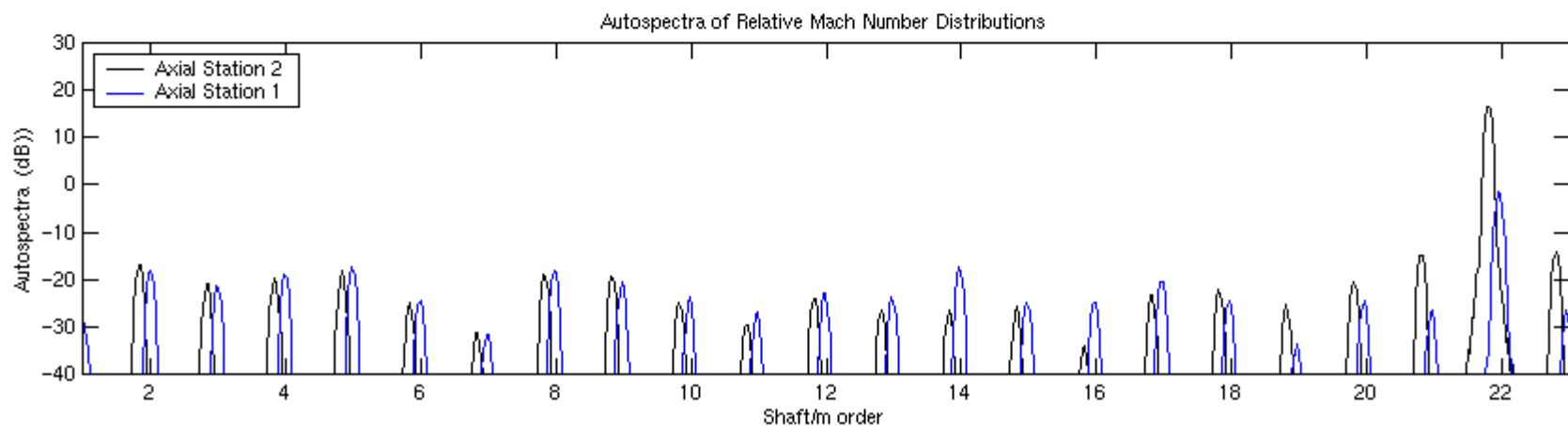
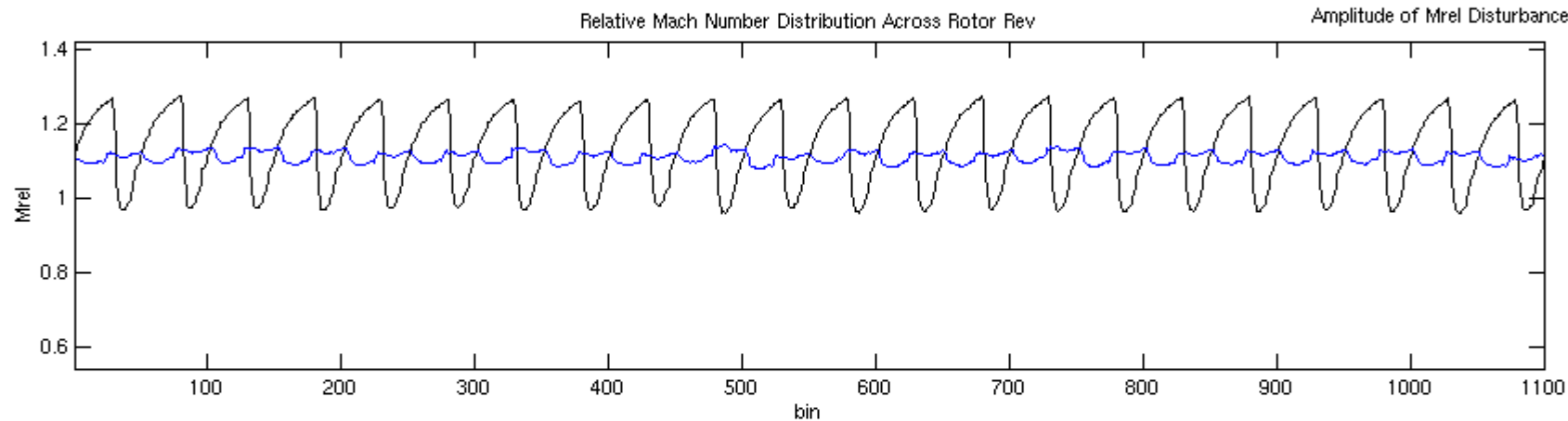
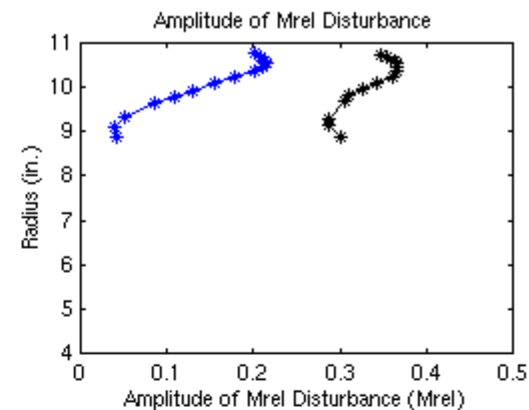
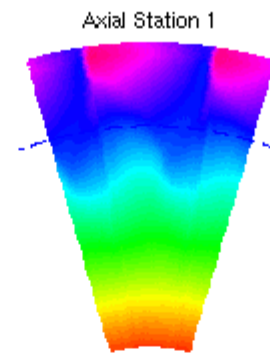
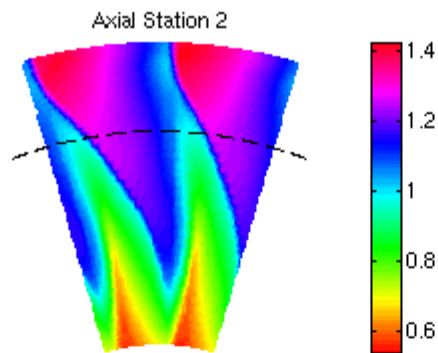
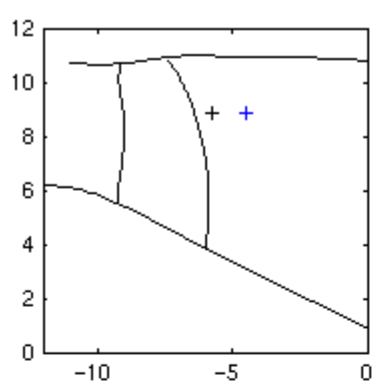


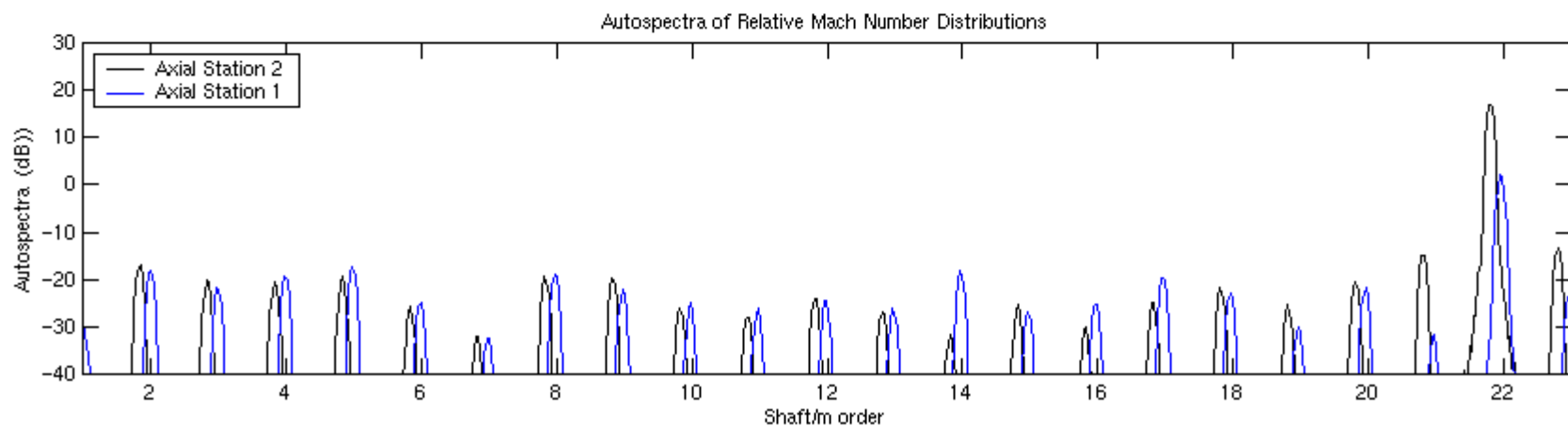
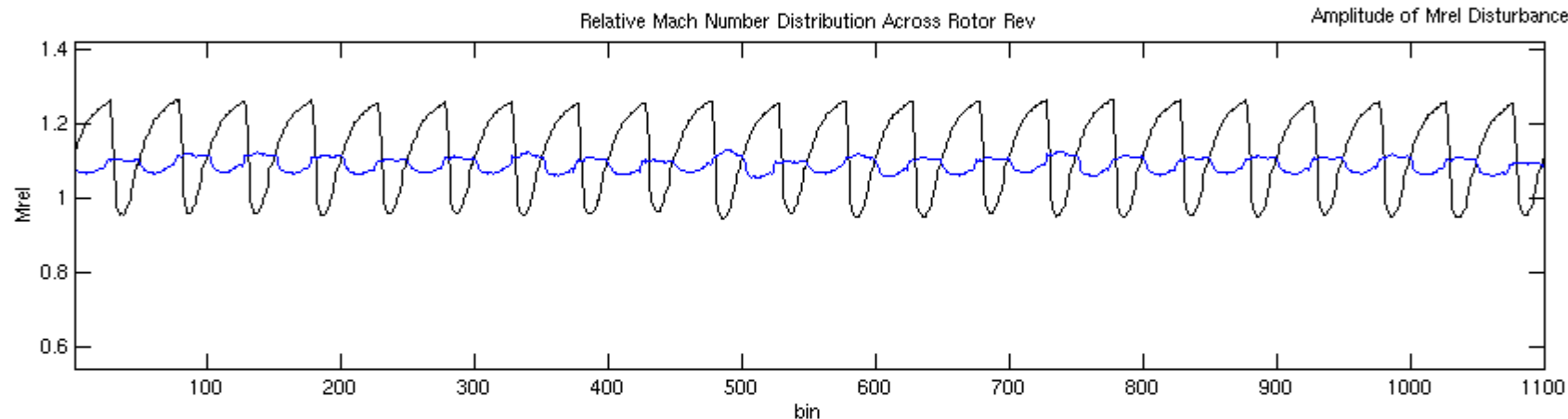
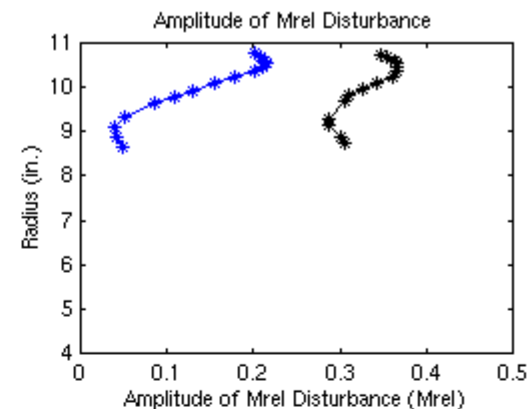
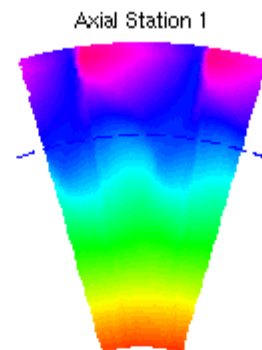
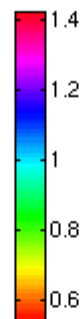
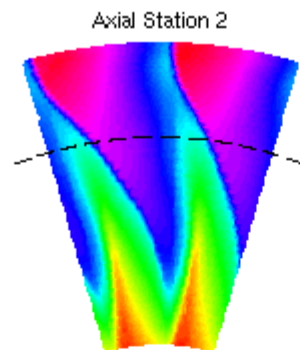
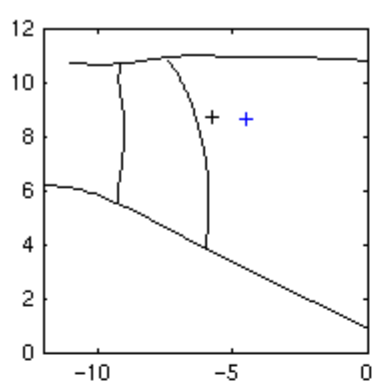


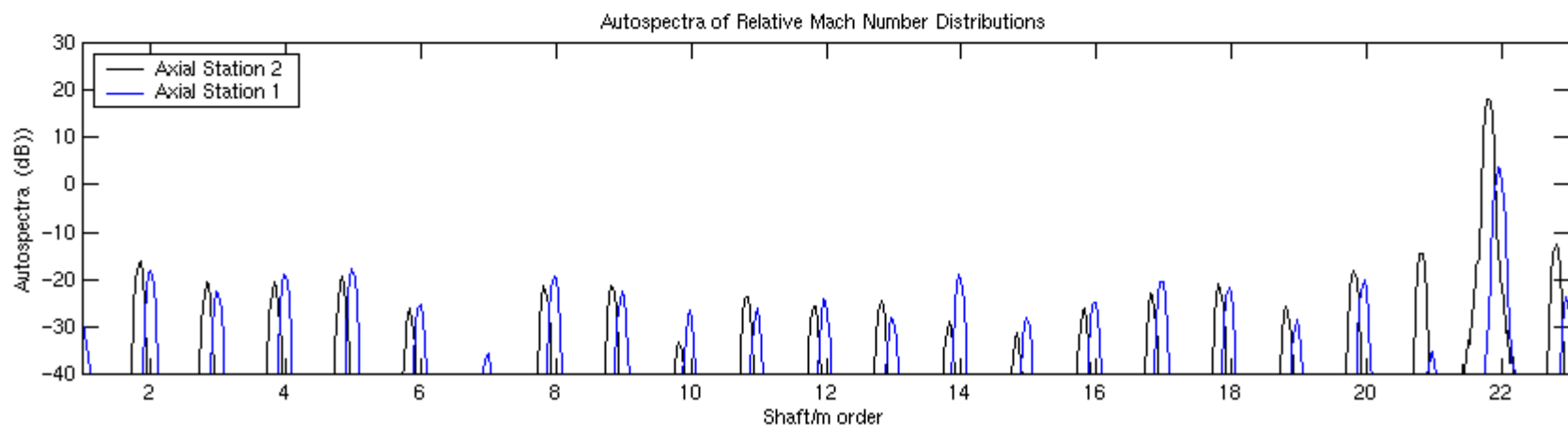
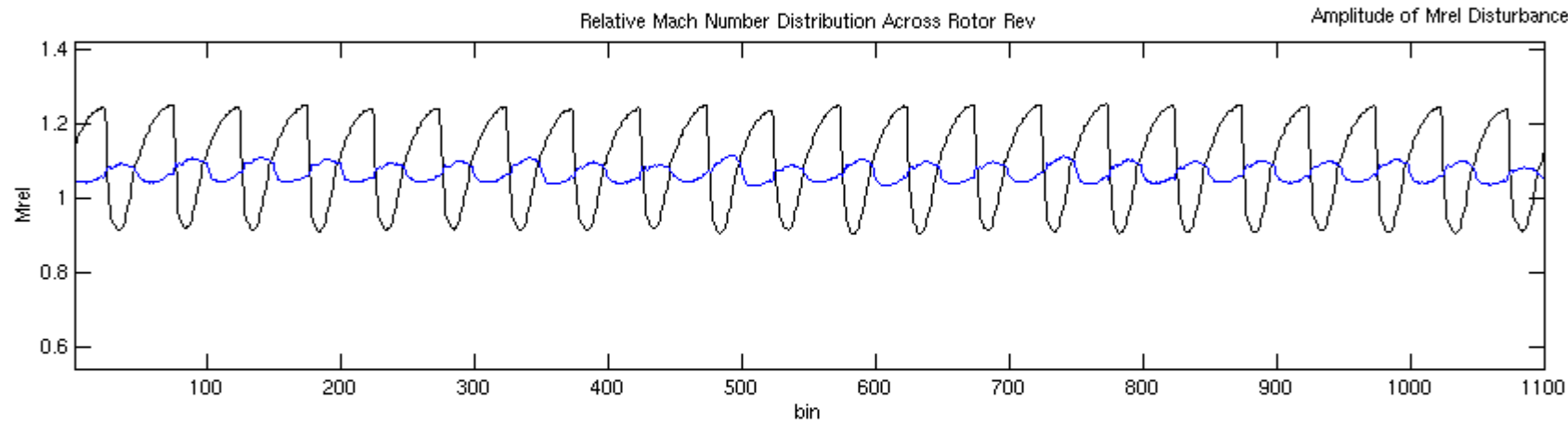
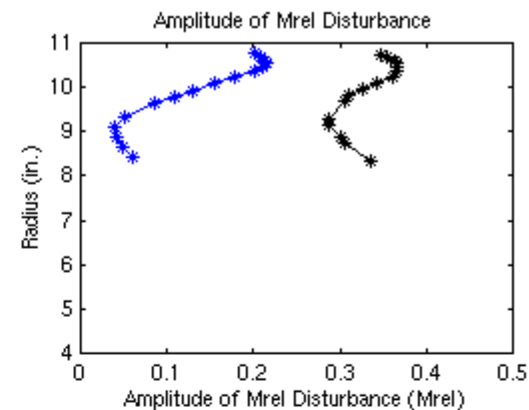
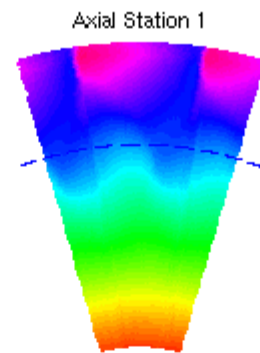
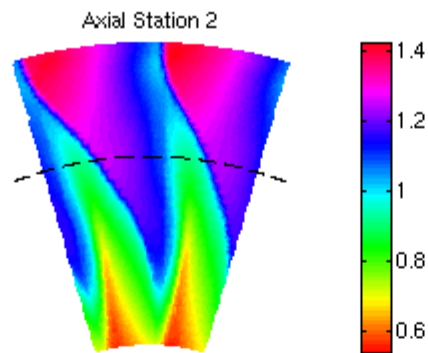
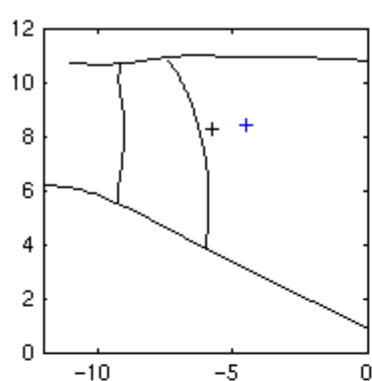


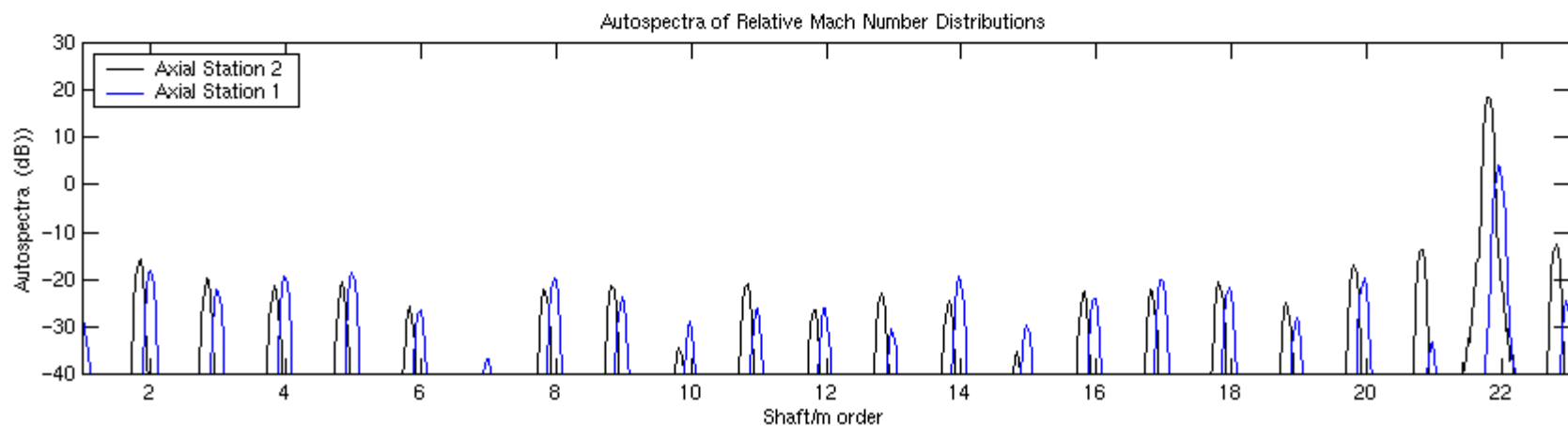
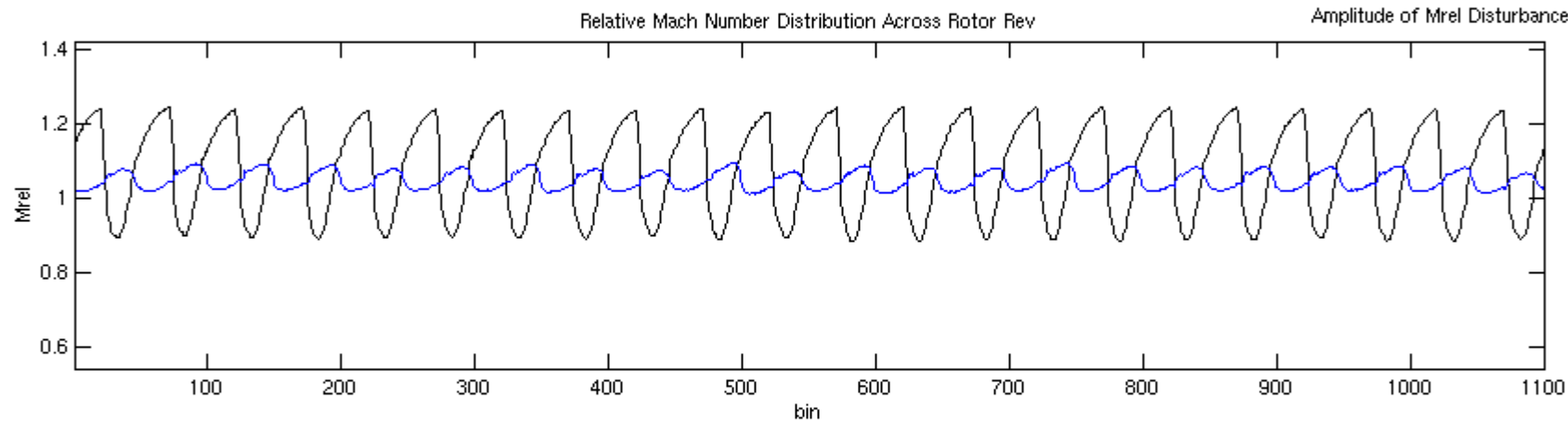
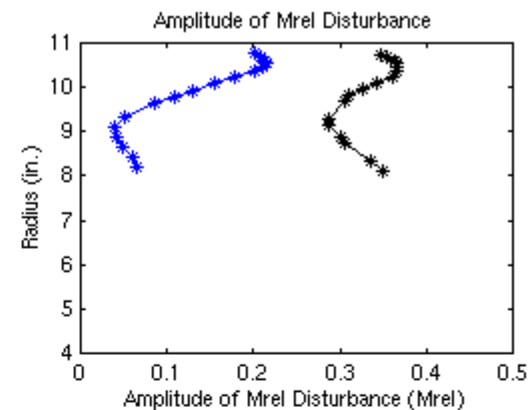
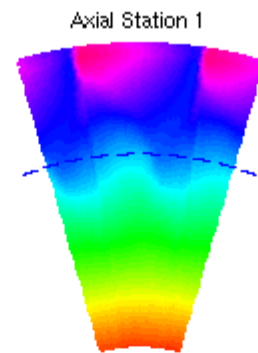
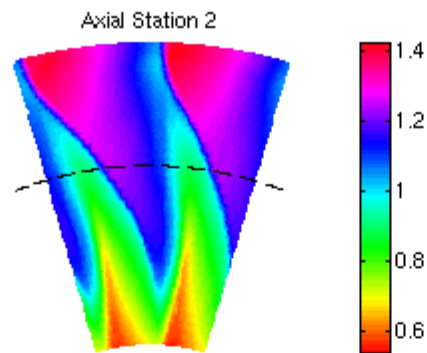
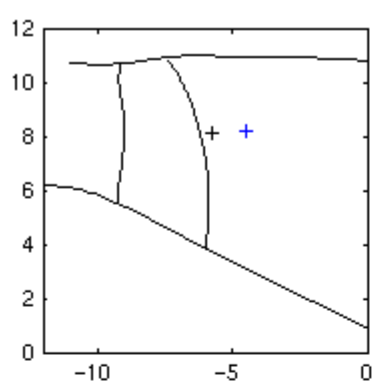


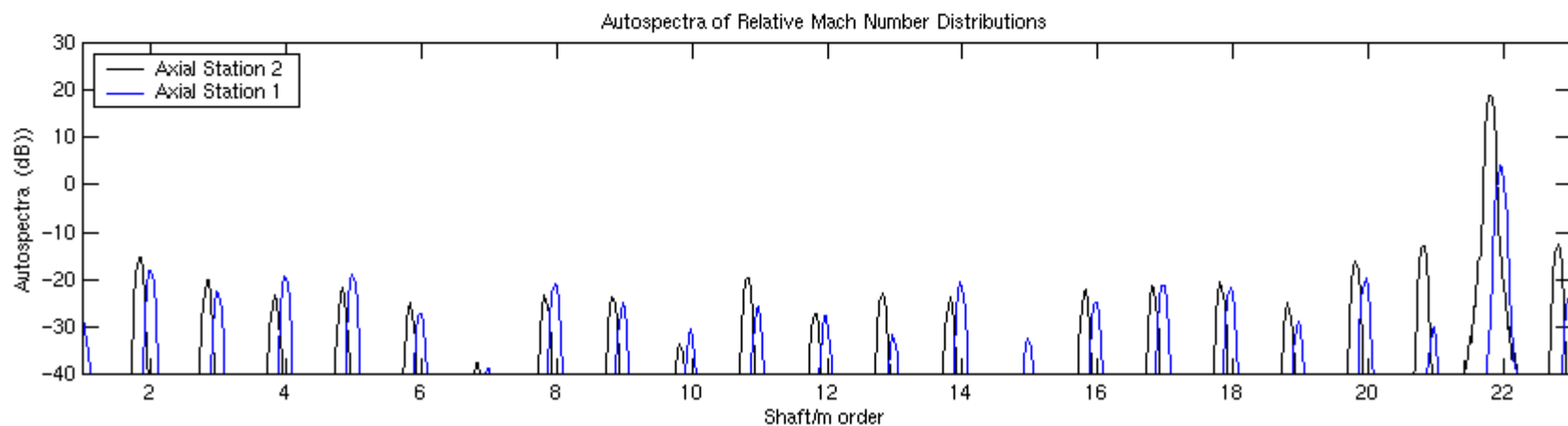
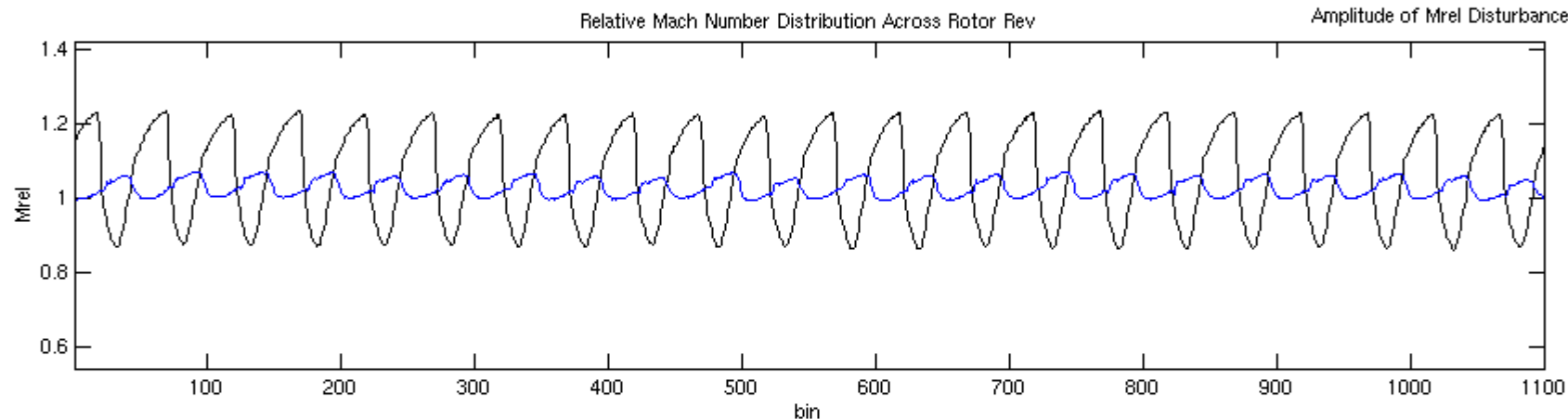
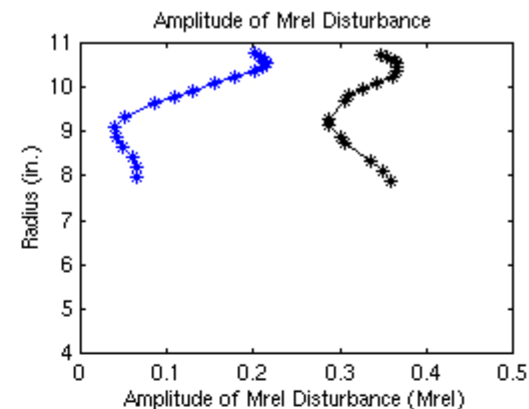
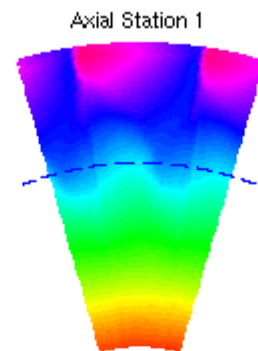
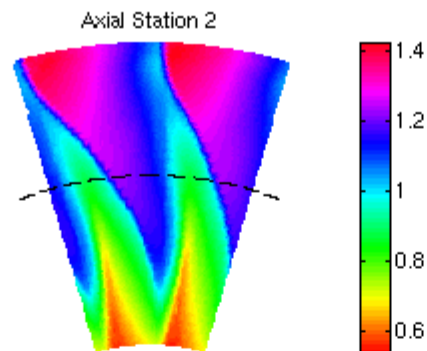
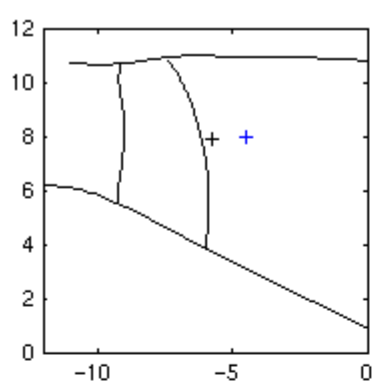


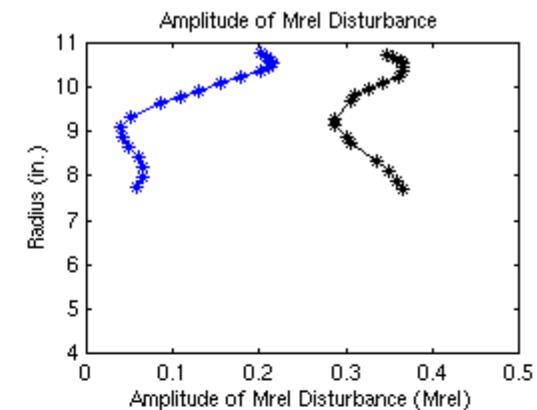
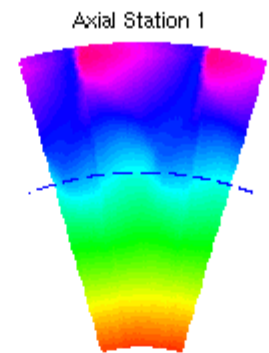
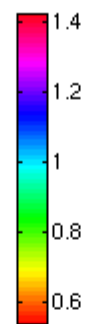
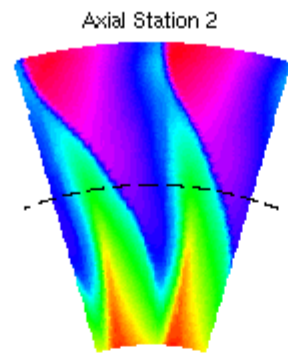
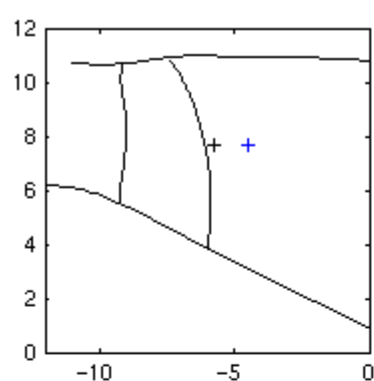




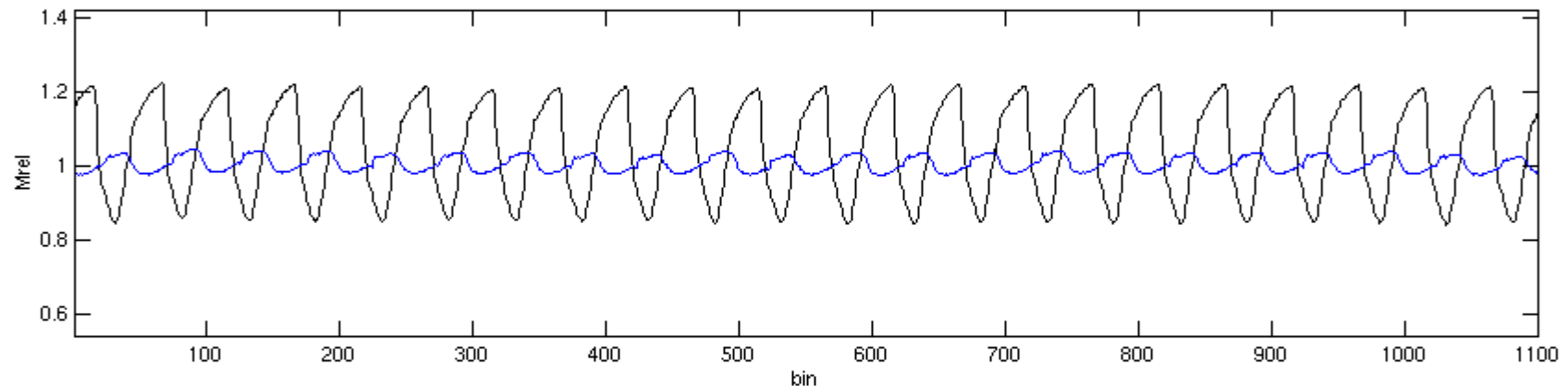




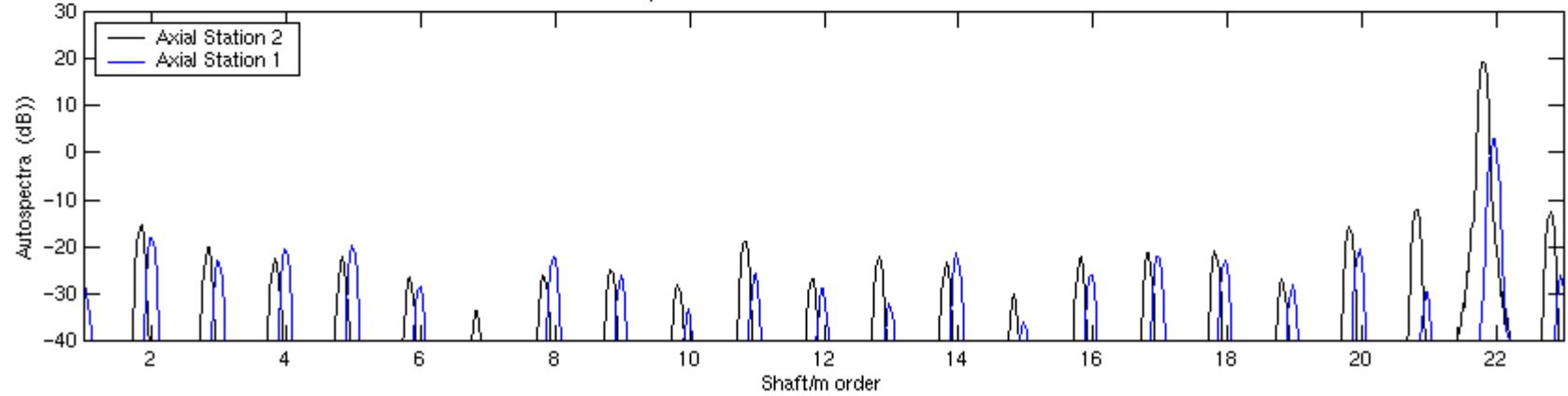


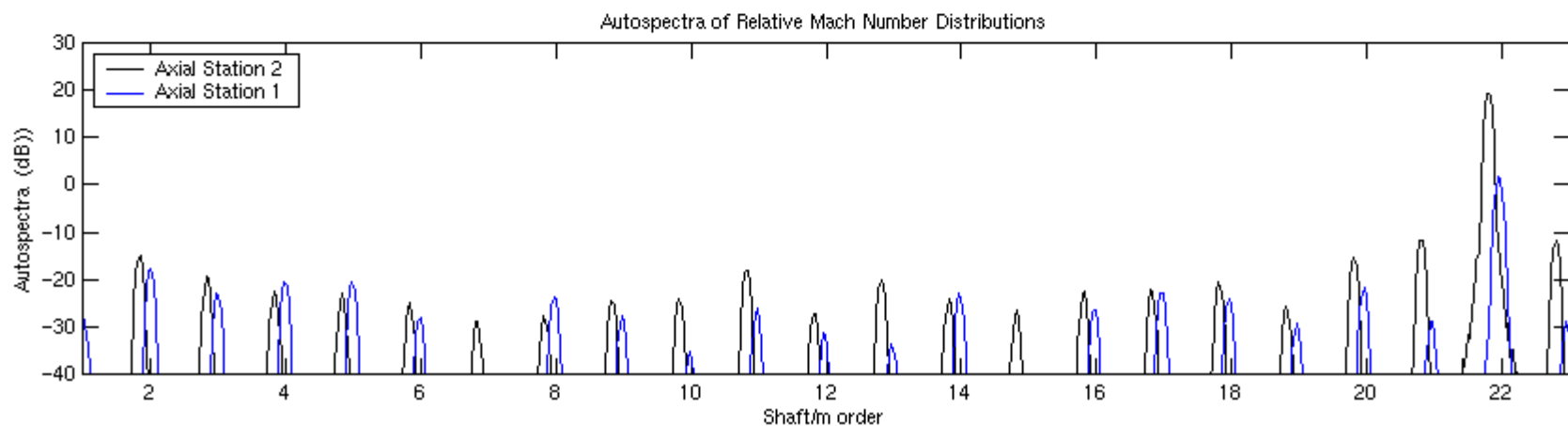
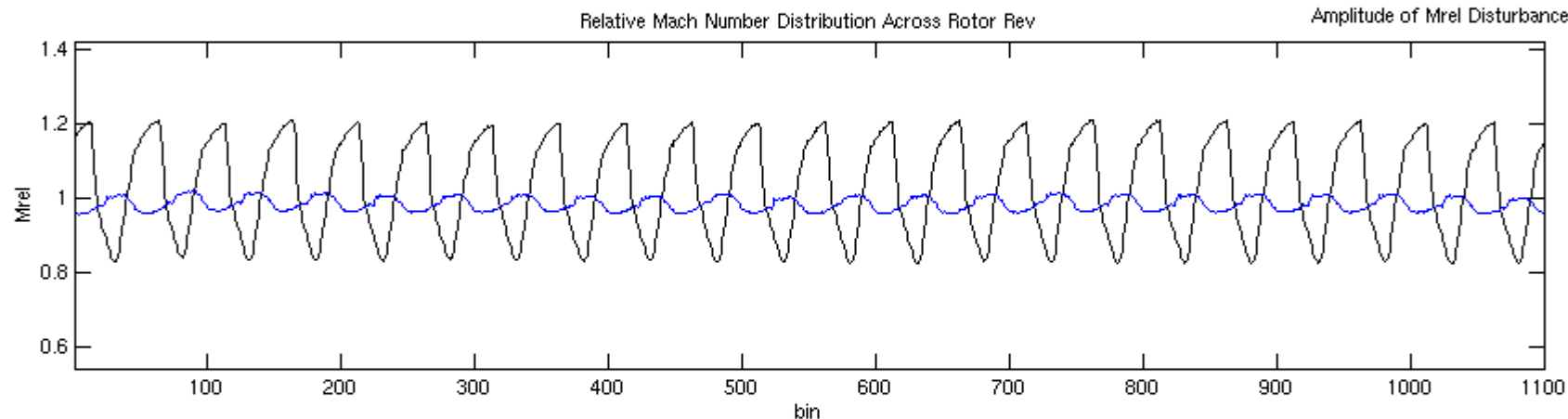
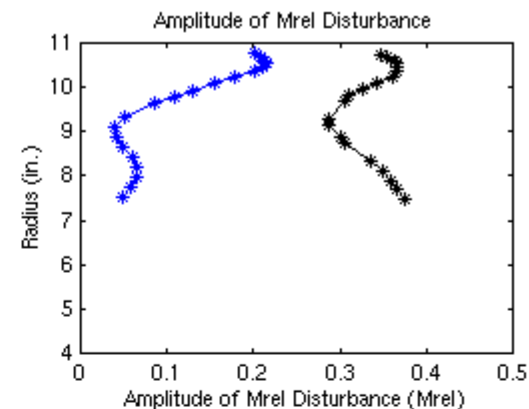
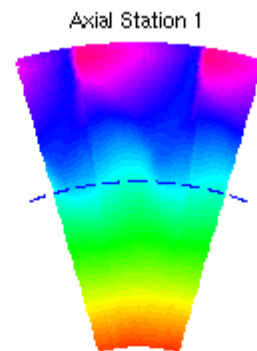
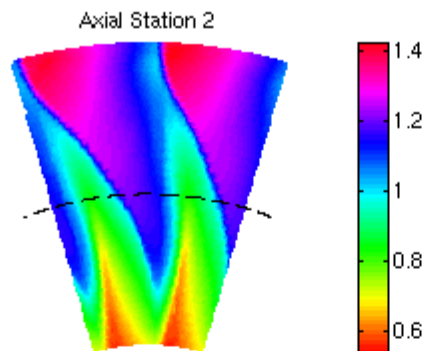
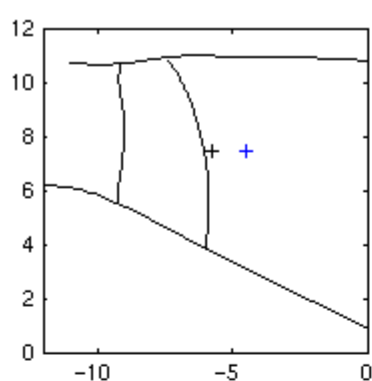


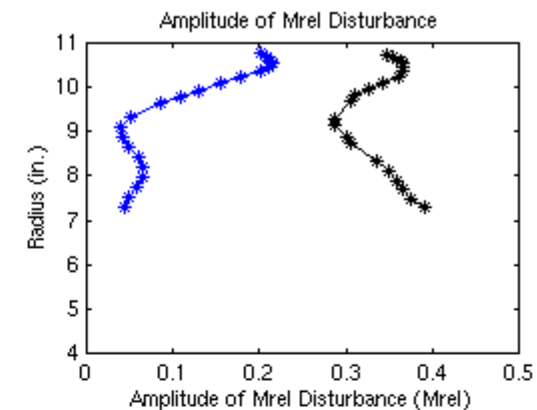
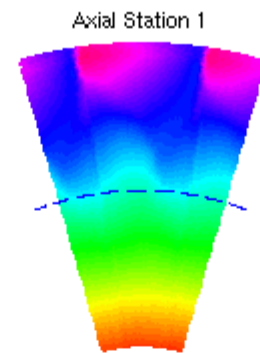
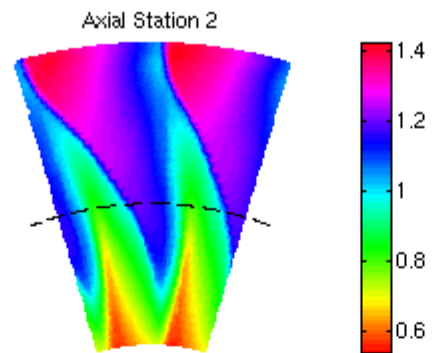
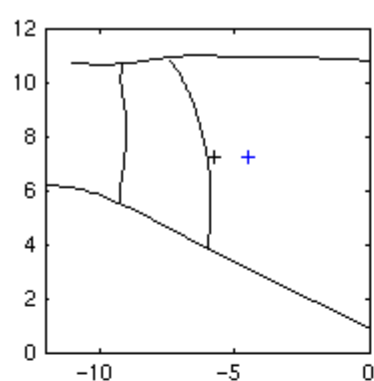
Relative Mach Number Distribution Across Rotor Rev



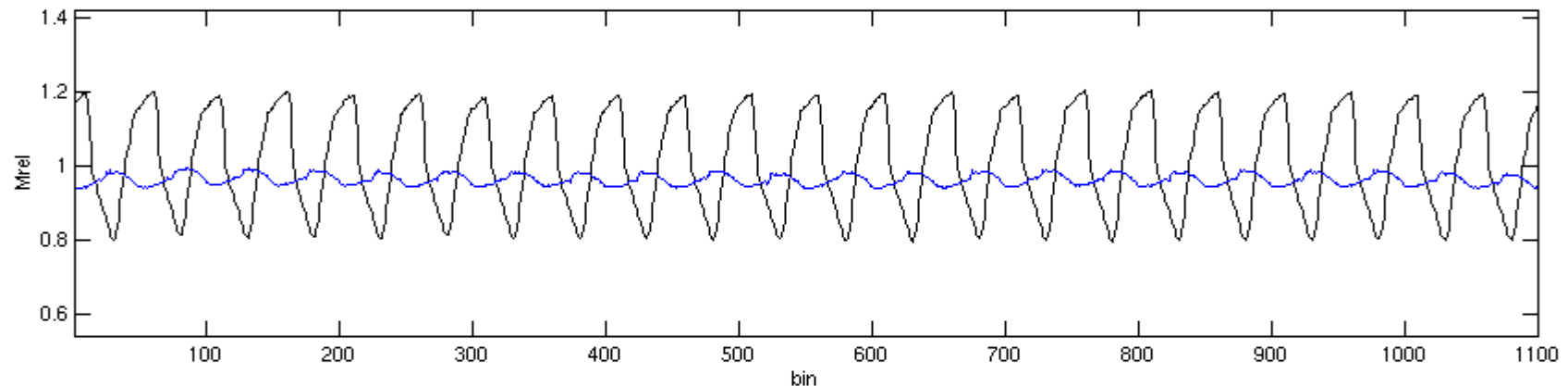
Autospectra of Relative Mach Number Distributions



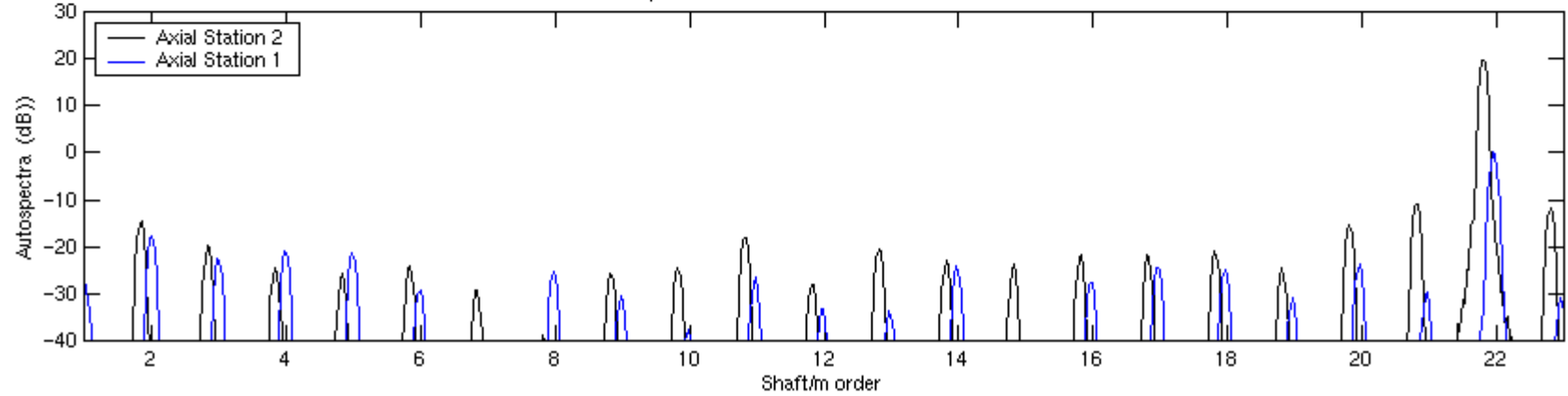


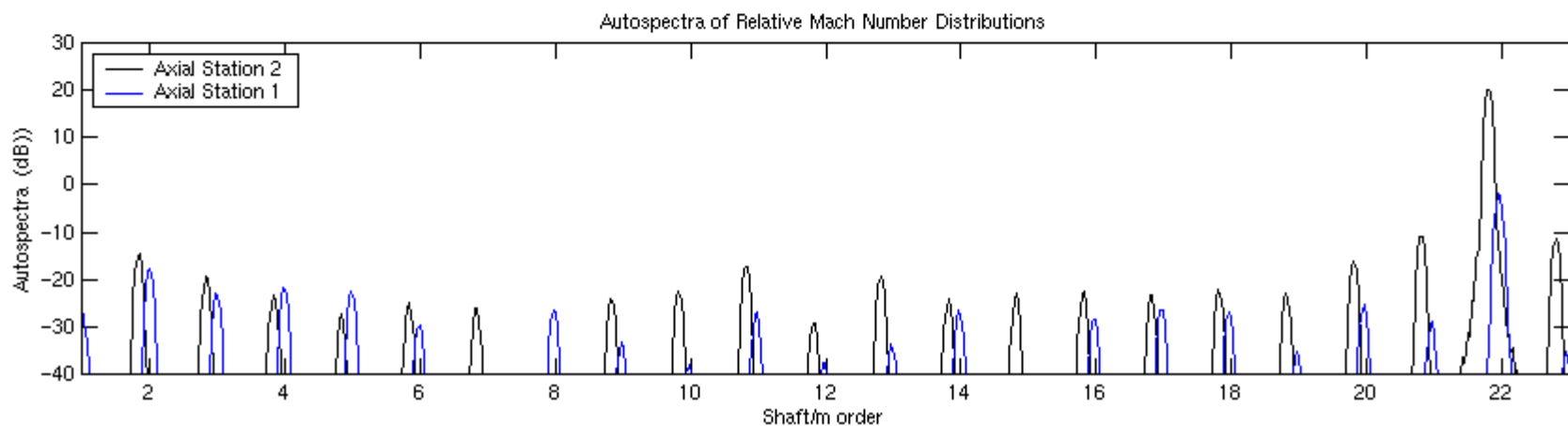
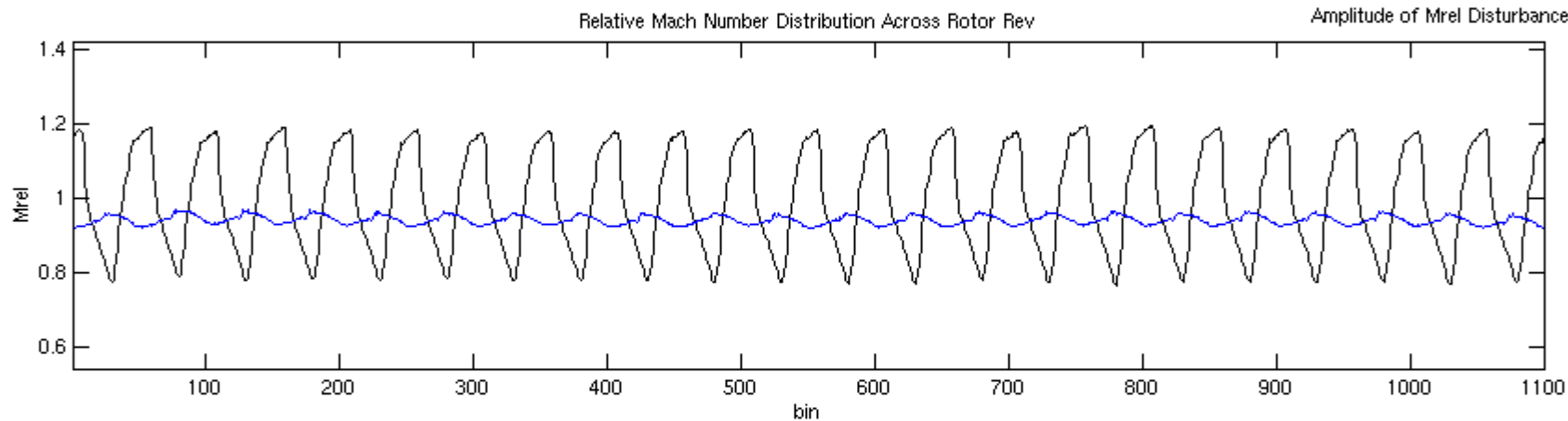
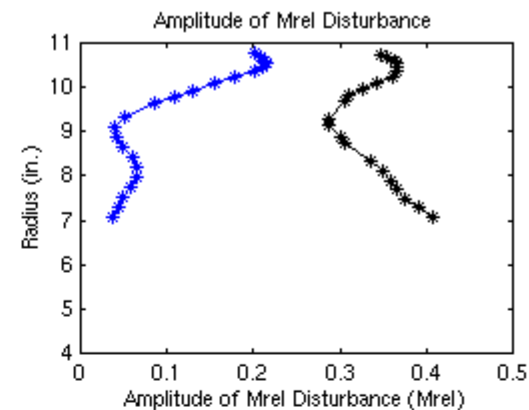
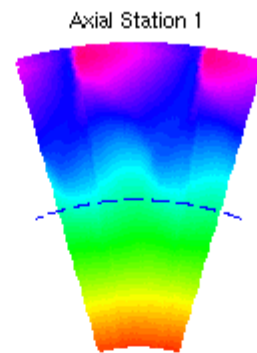
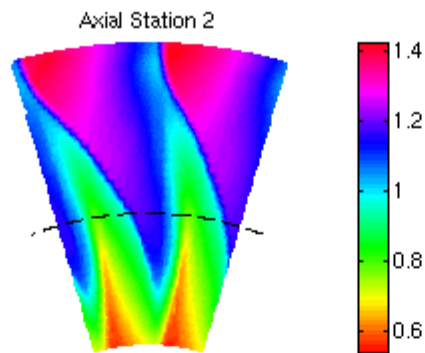
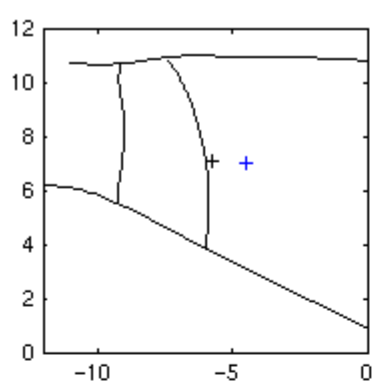


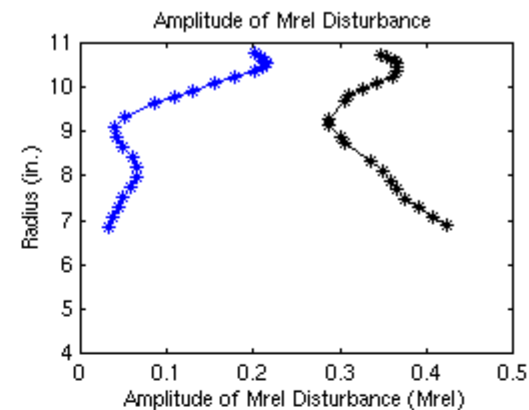
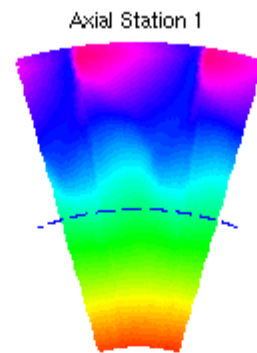
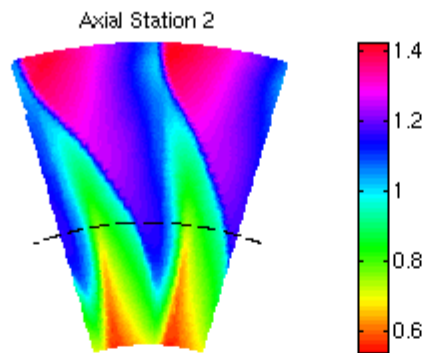
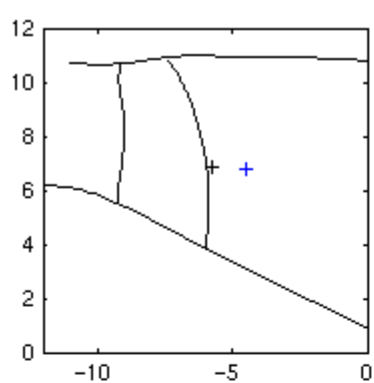
Relative Mach Number Distribution Across Rotor Rev



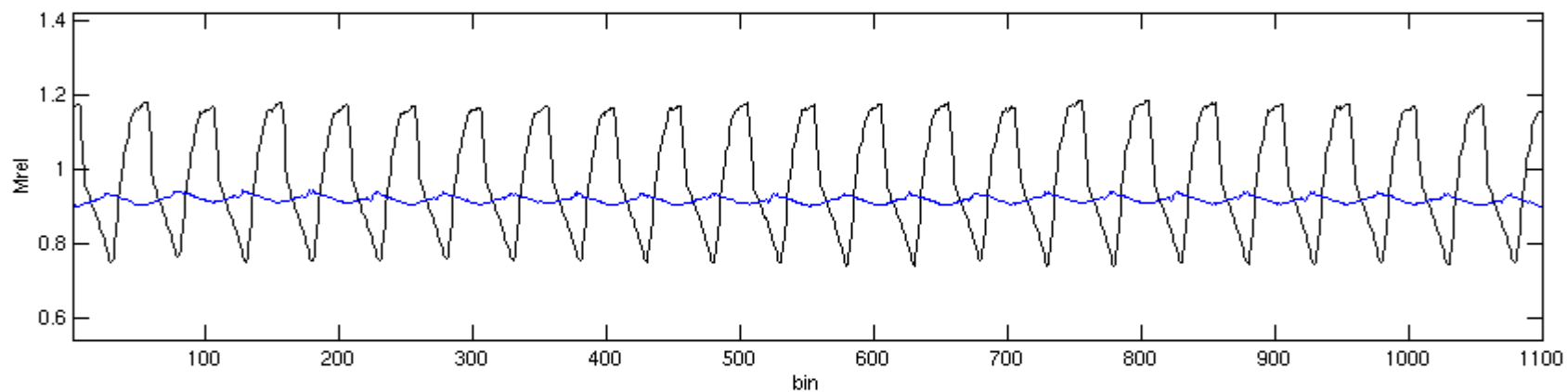
Autospectra of Relative Mach Number Distributions



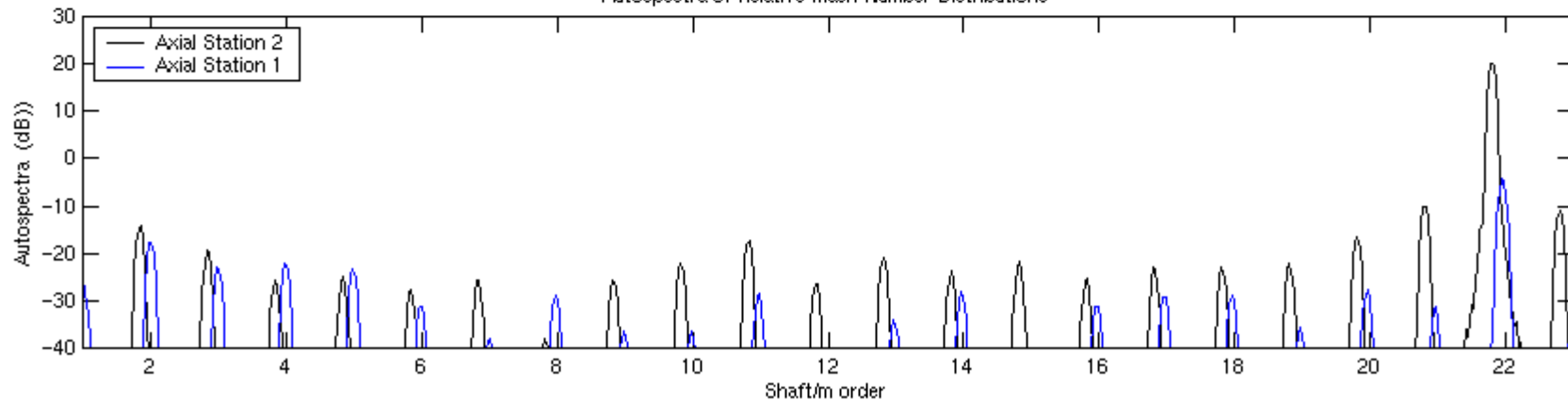


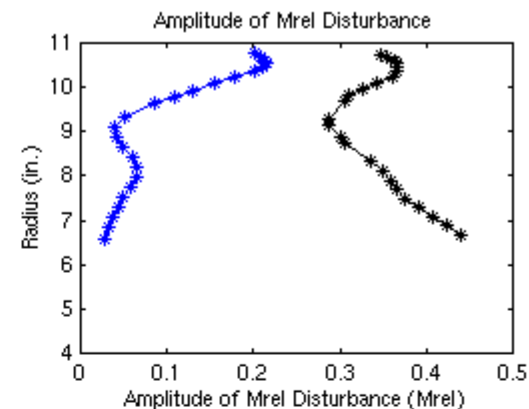
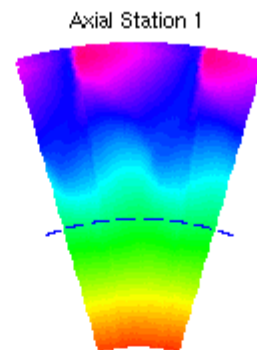
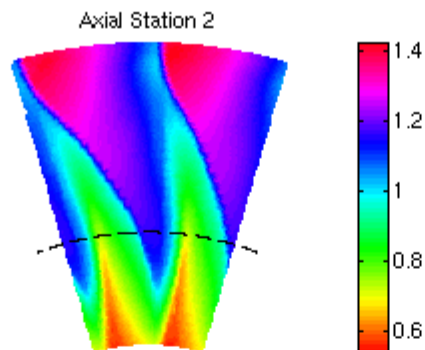
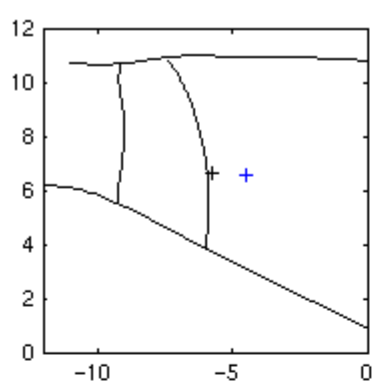


Relative Mach Number Distribution Across Rotor Rev

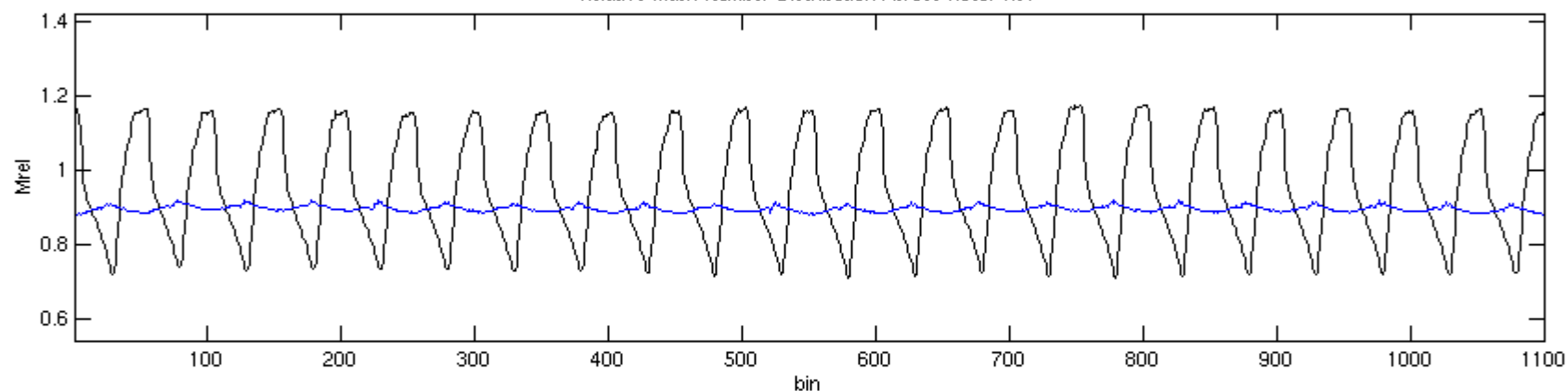


Autospectra of Relative Mach Number Distributions

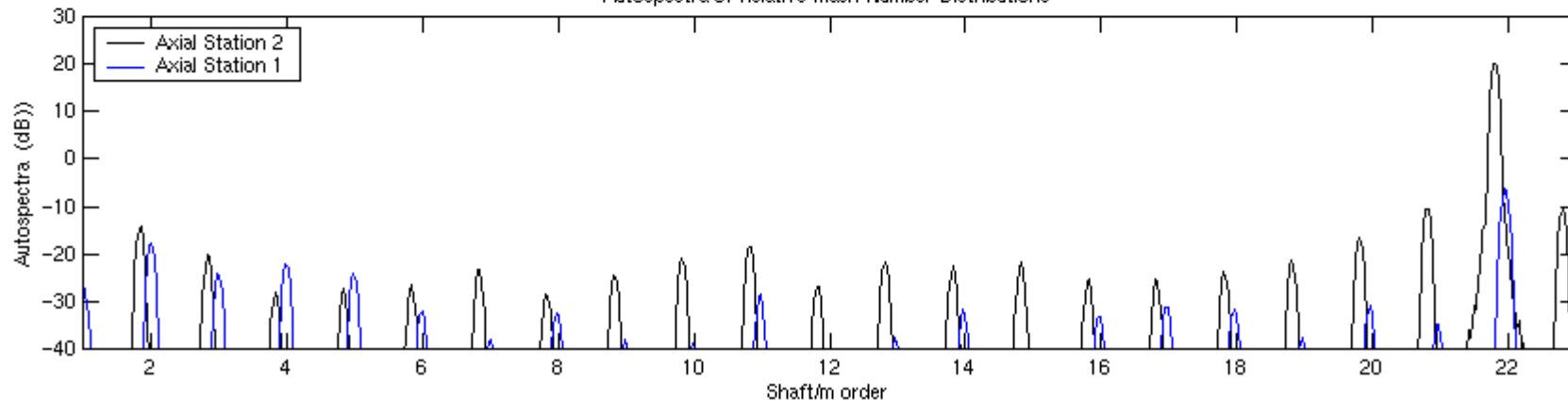


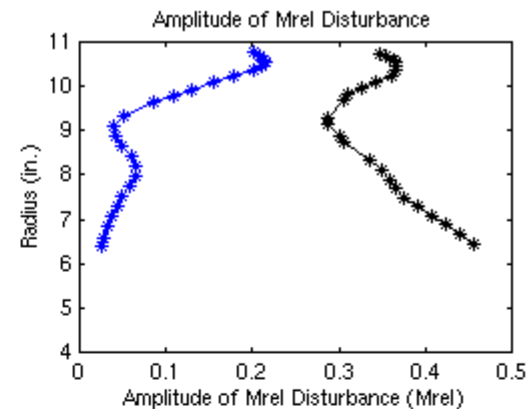
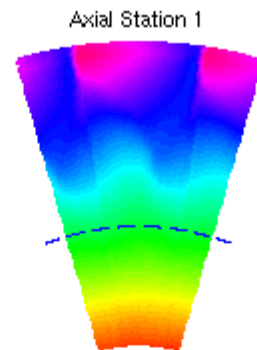
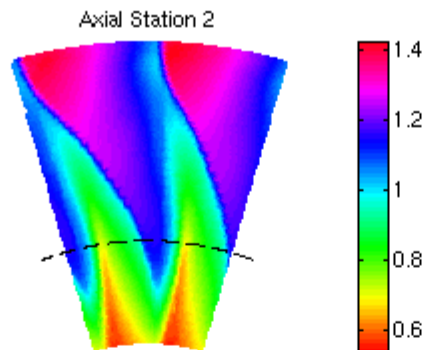
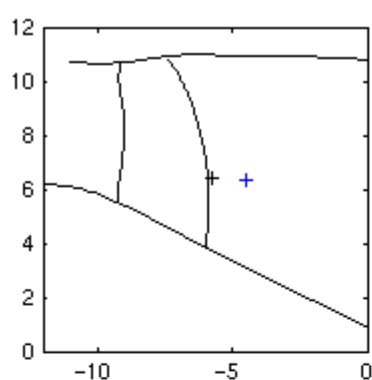


Relative Mach Number Distribution Across Rotor Rev

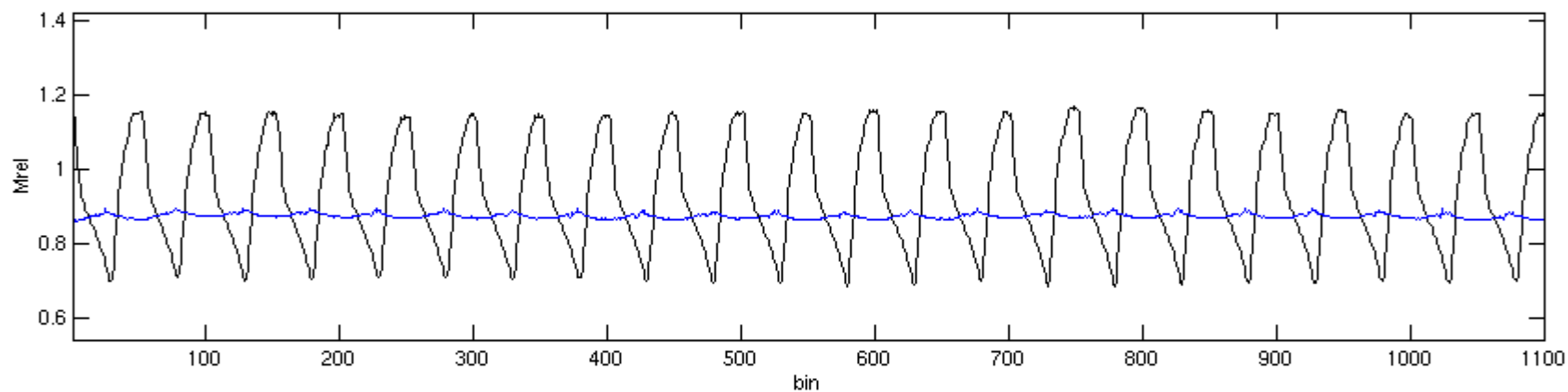


Autospectra of Relative Mach Number Distributions

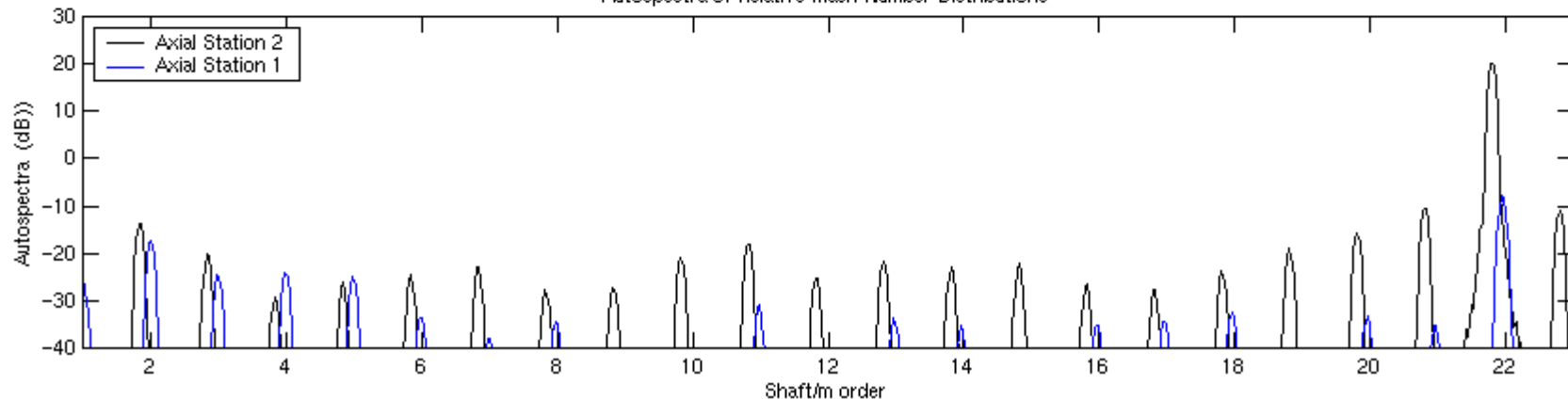


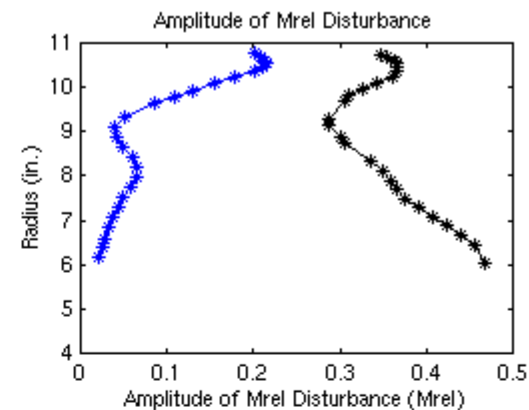
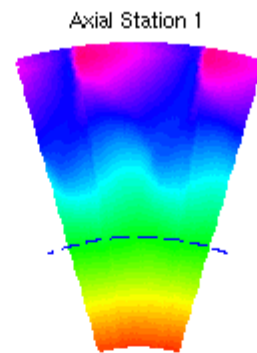
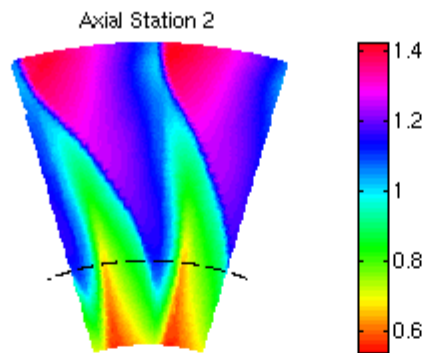
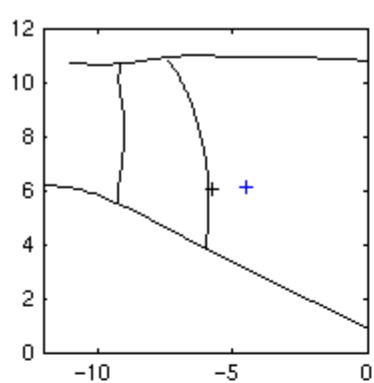


Relative Mach Number Distribution Across Rotor Rev

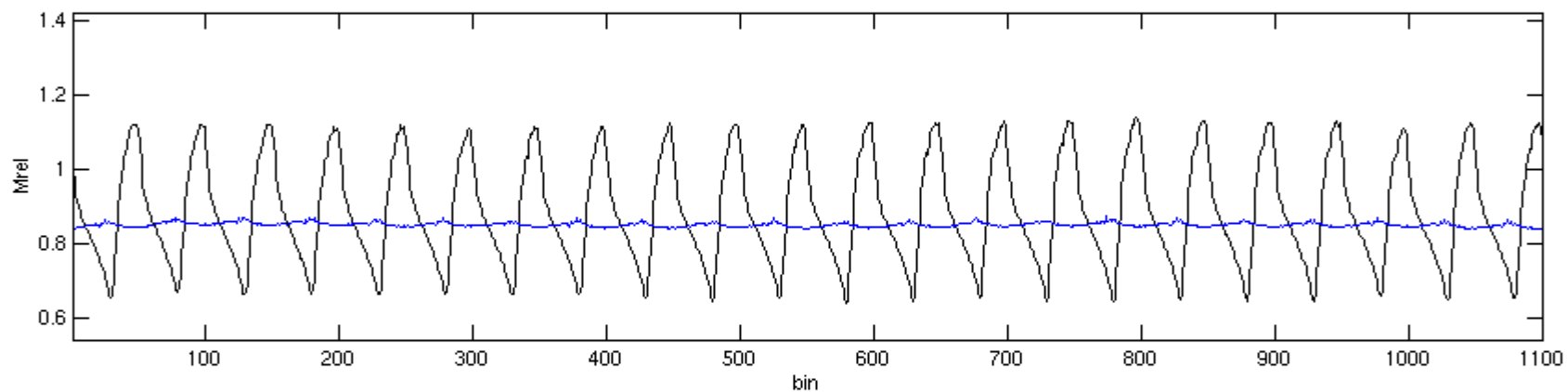


Autospectra of Relative Mach Number Distributions

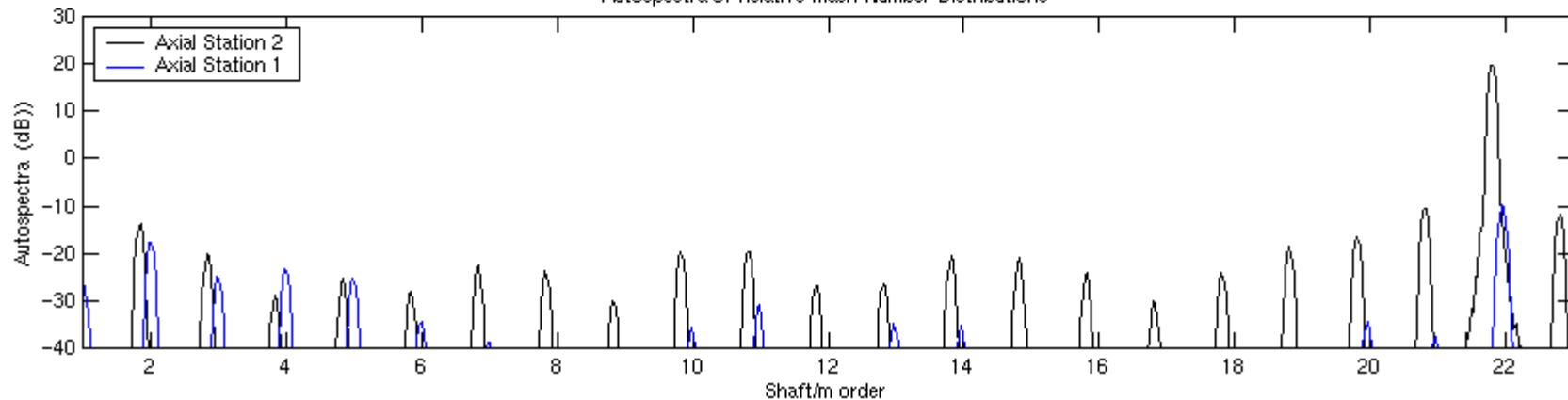


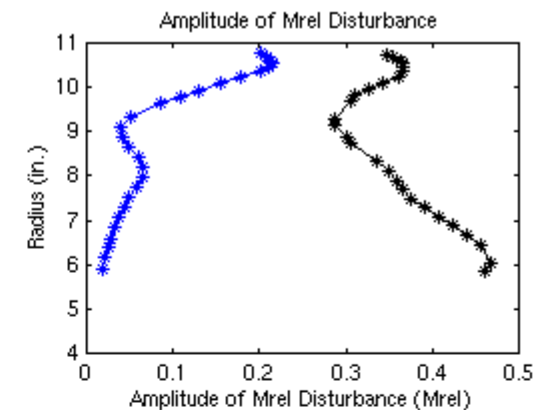
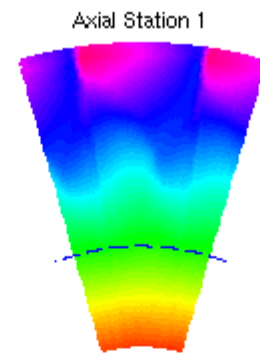
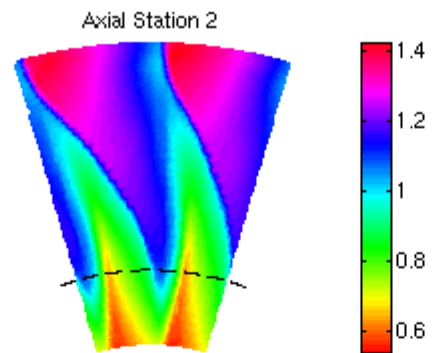
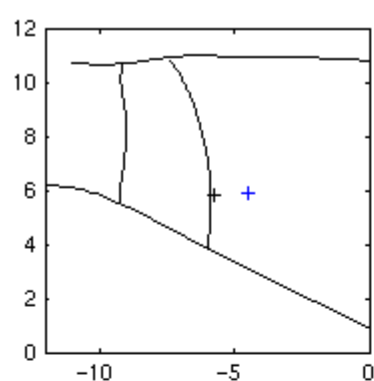


Relative Mach Number Distribution Across Rotor Rev

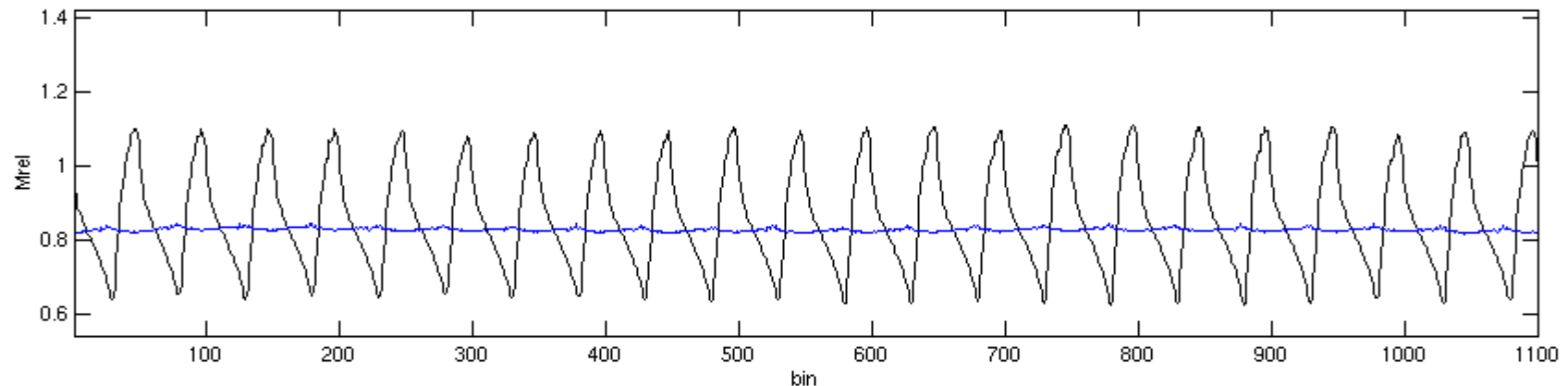


Autospectra of Relative Mach Number Distributions

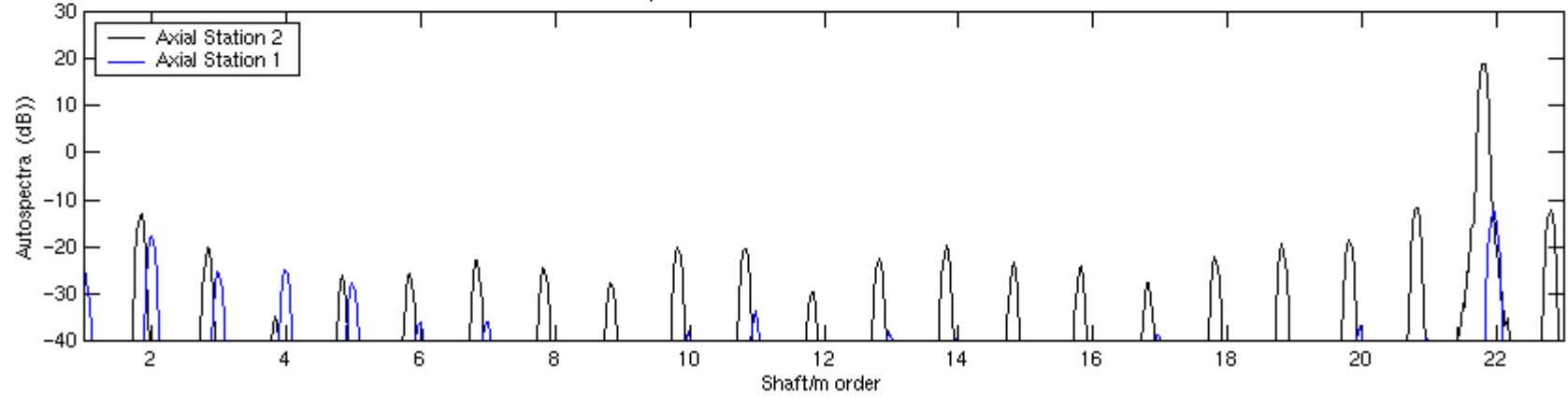


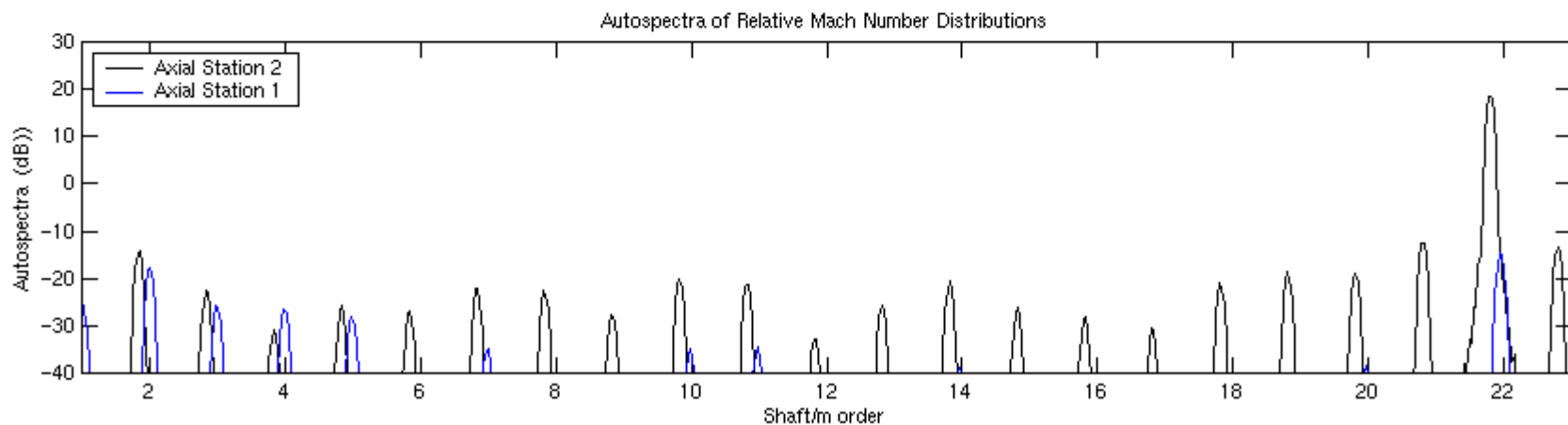
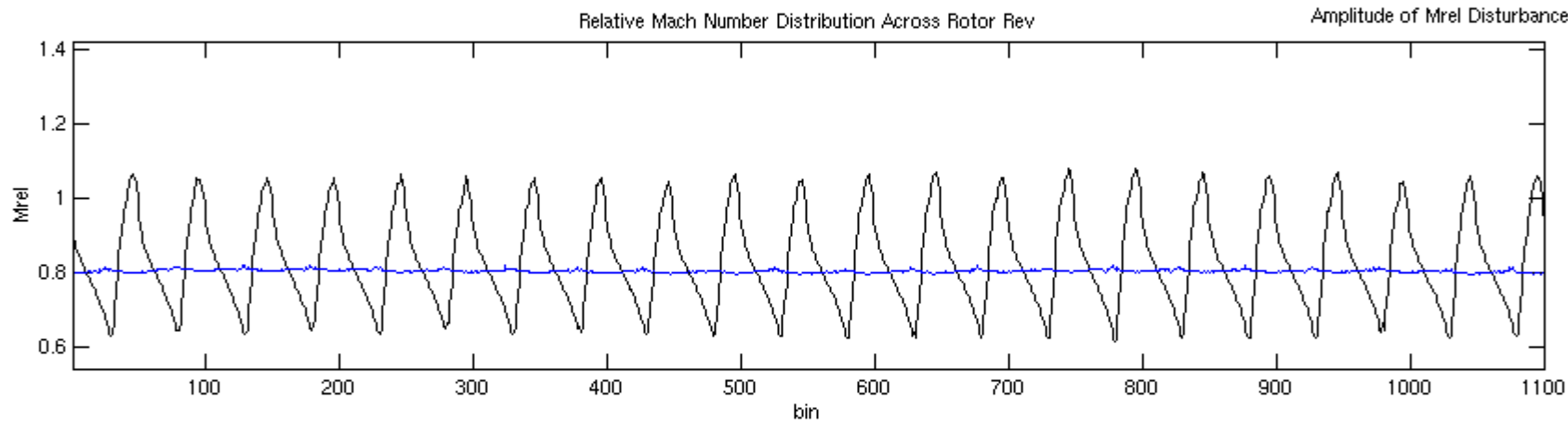
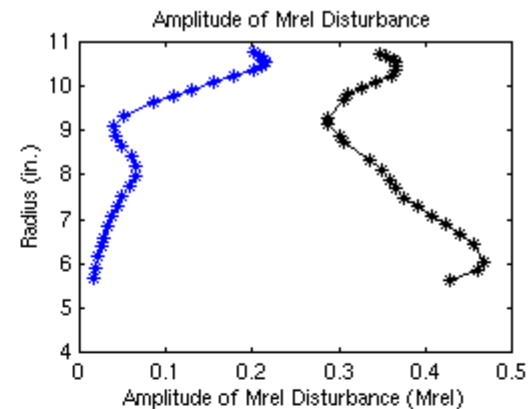
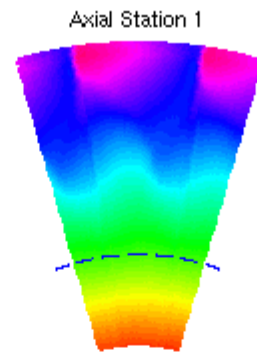
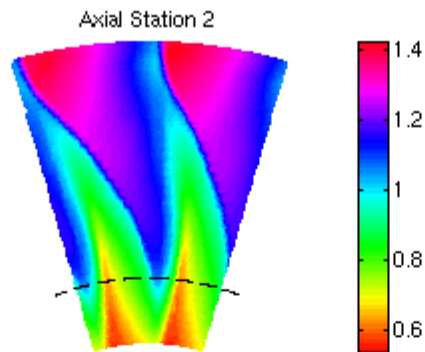
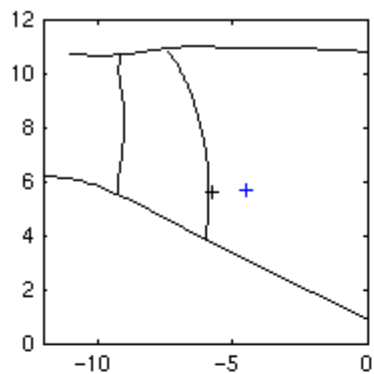


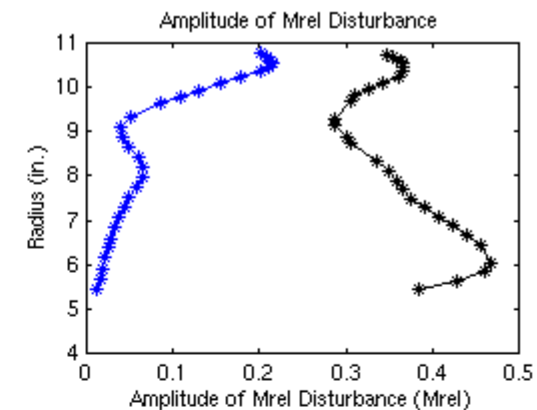
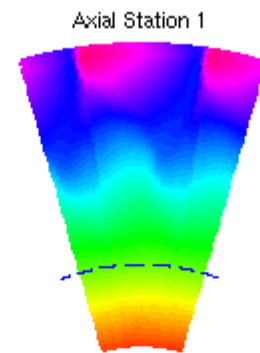
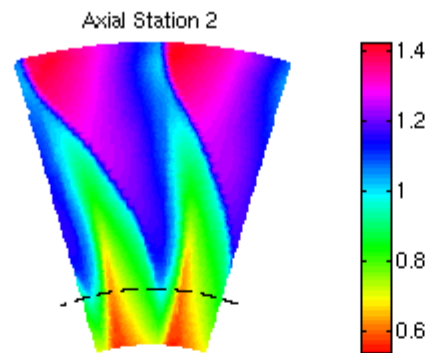
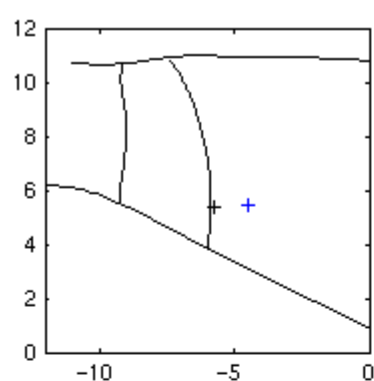
Relative Mach Number Distribution Across Rotor Rev



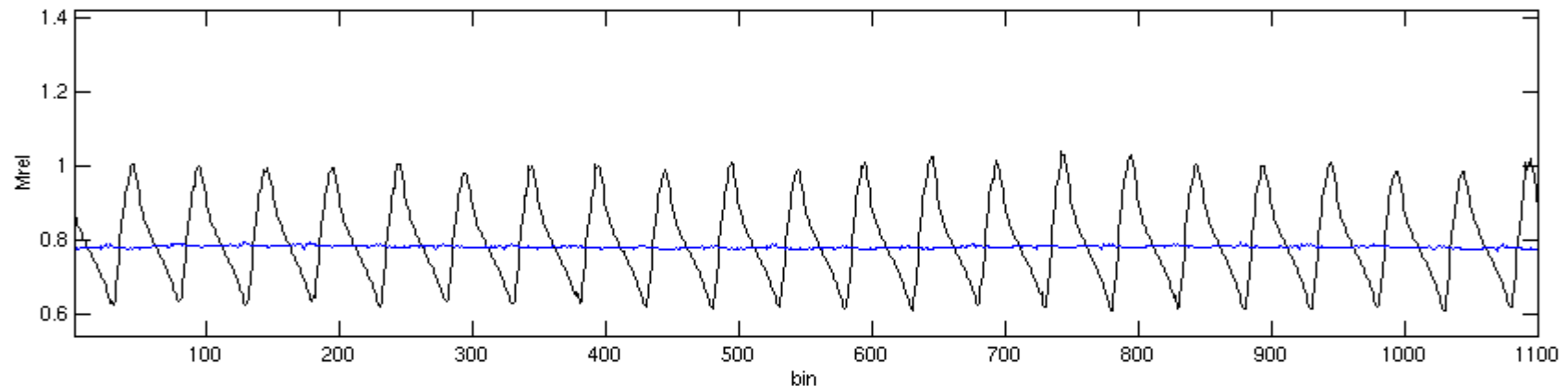
Autospectra of Relative Mach Number Distributions



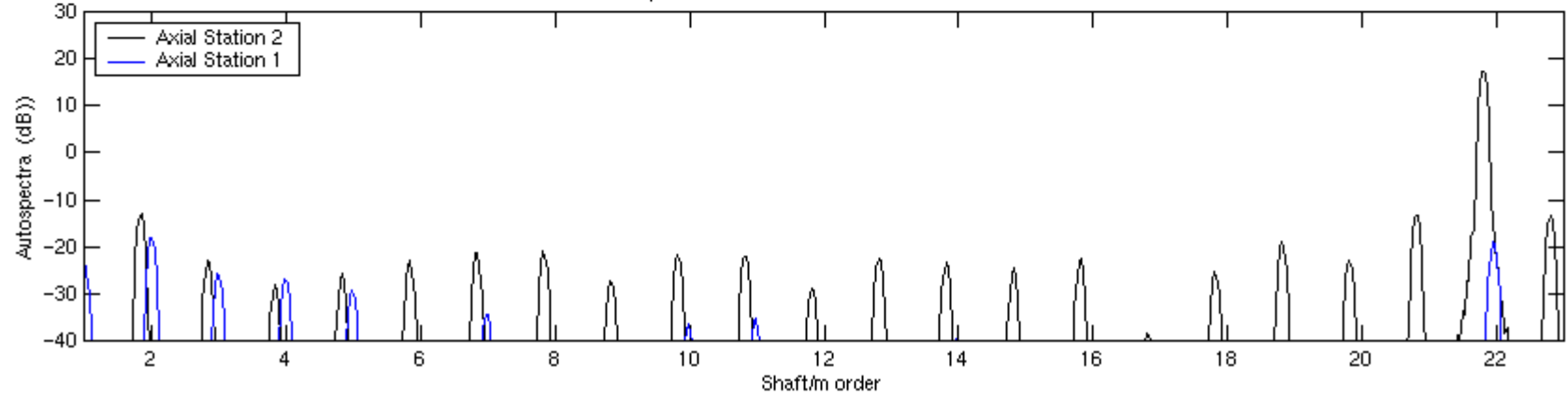


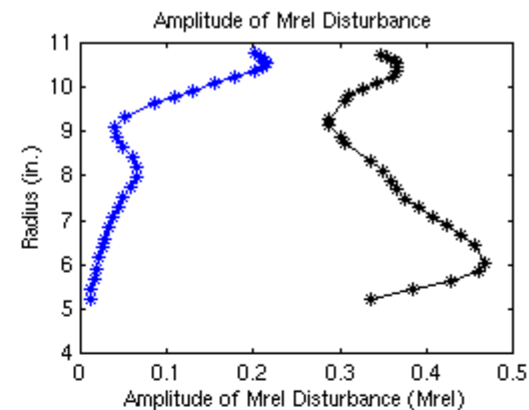
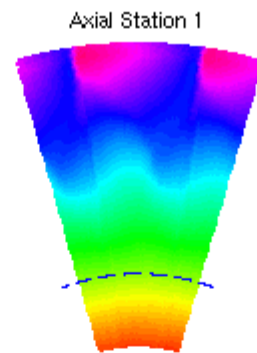
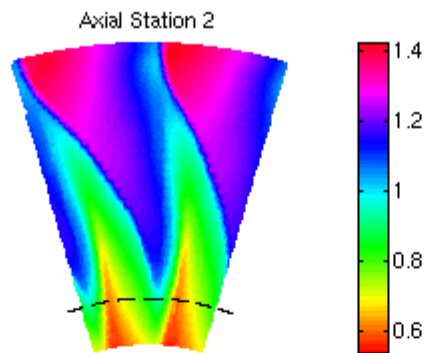
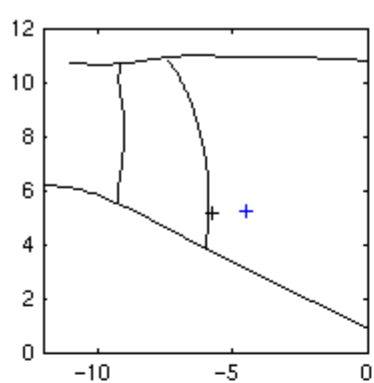


Relative Mach Number Distribution Across Rotor Rev

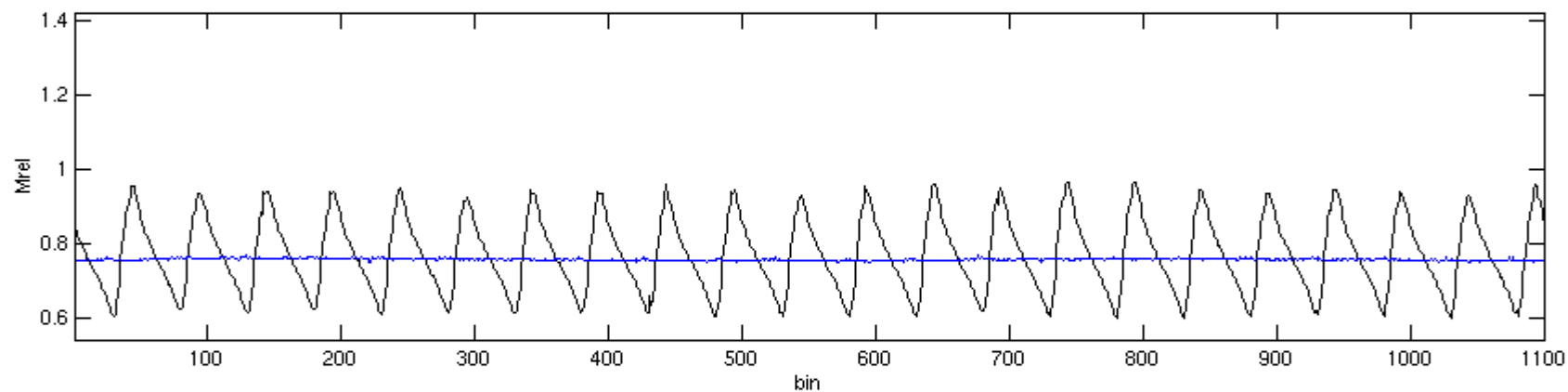


Autospectra of Relative Mach Number Distributions

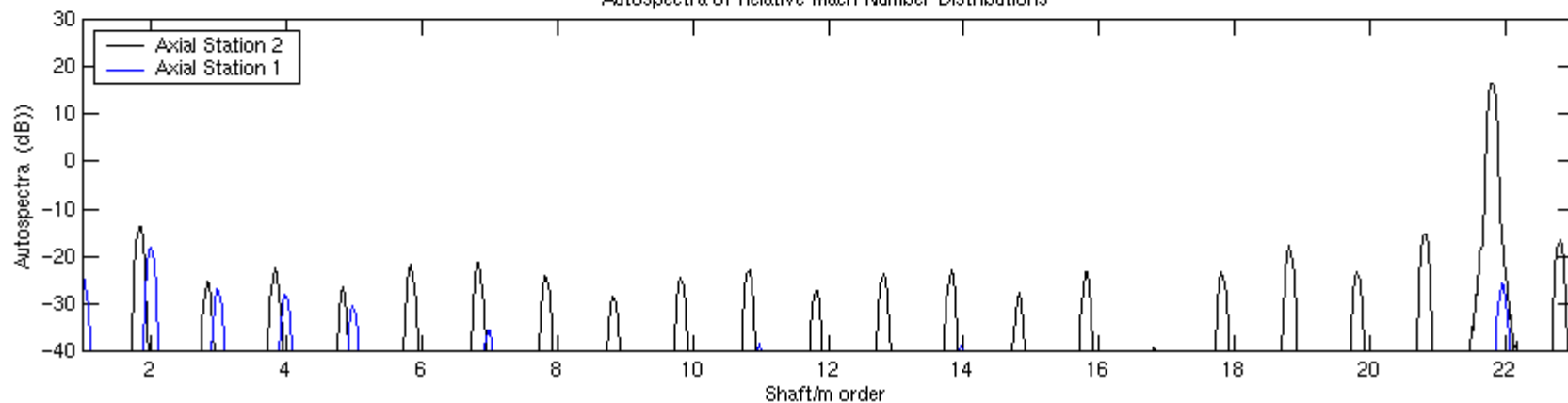


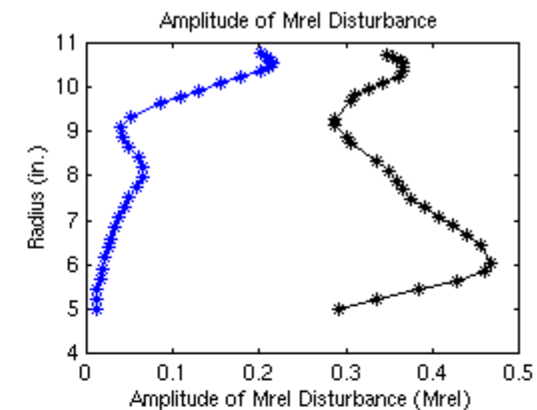
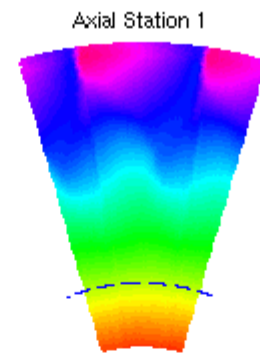
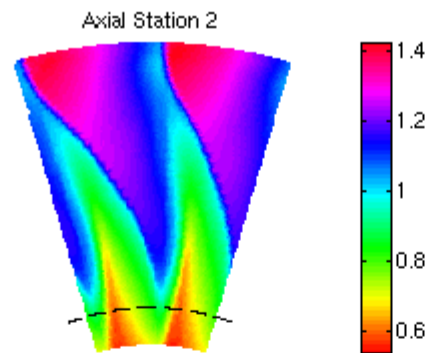
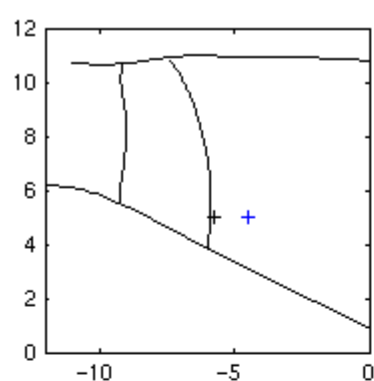


Relative Mach Number Distribution Across Rotor Rev

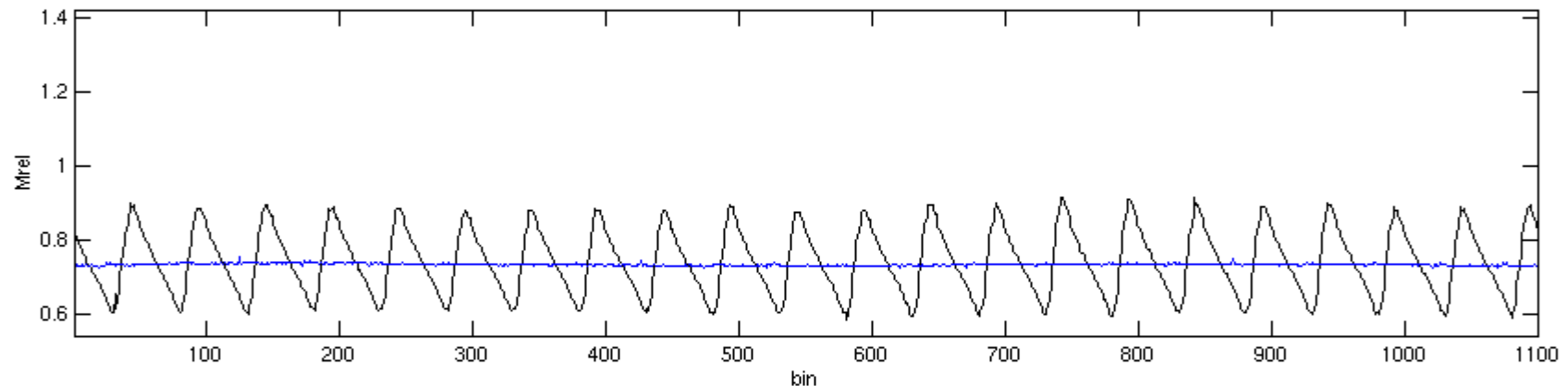


Autospectra of Relative Mach Number Distributions

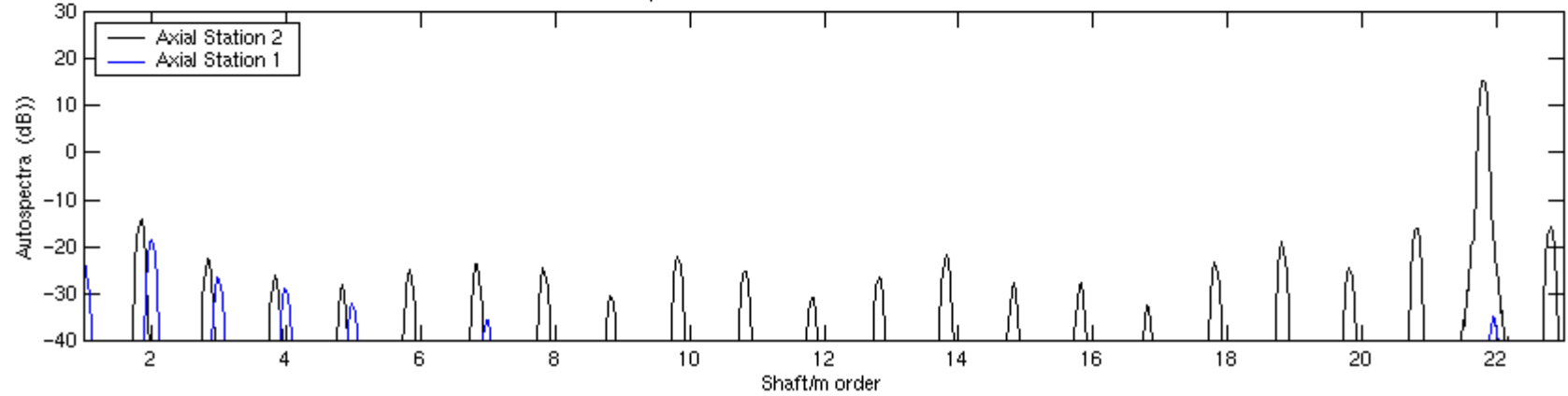


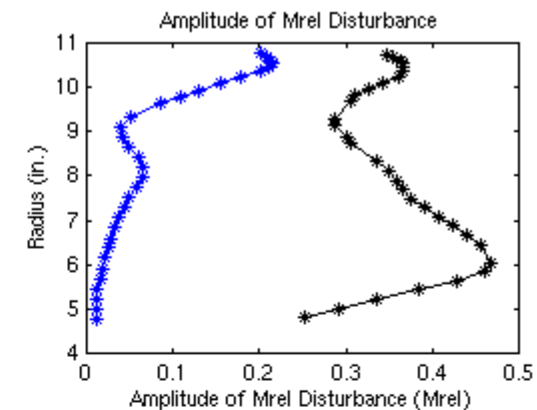
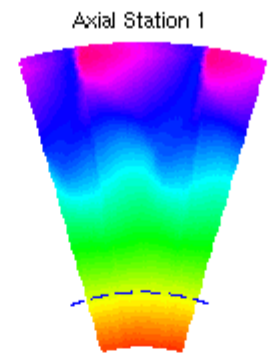
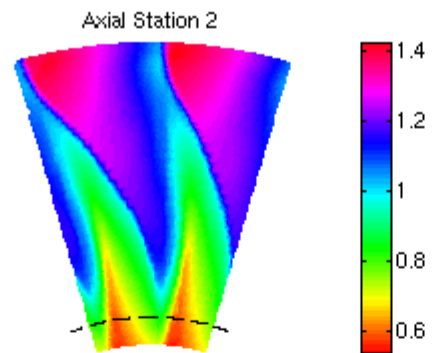
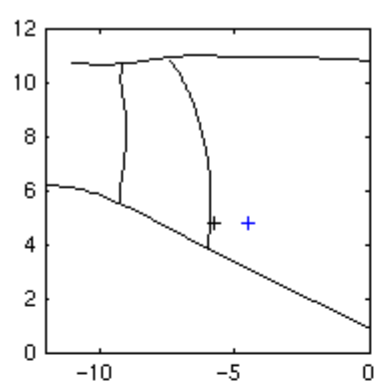


Relative Mach Number Distribution Across Rotor Rev

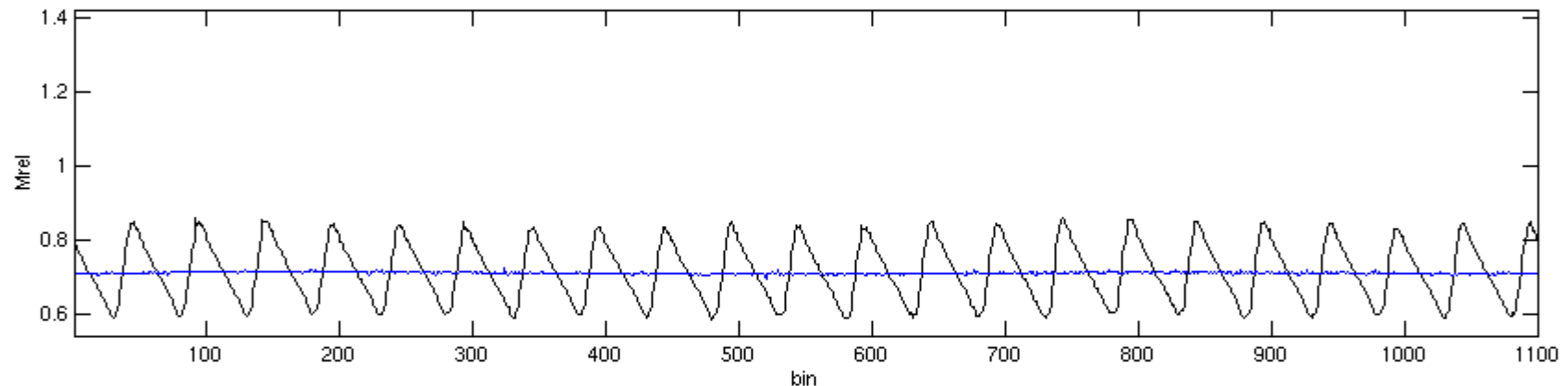


Autospectra of Relative Mach Number Distributions

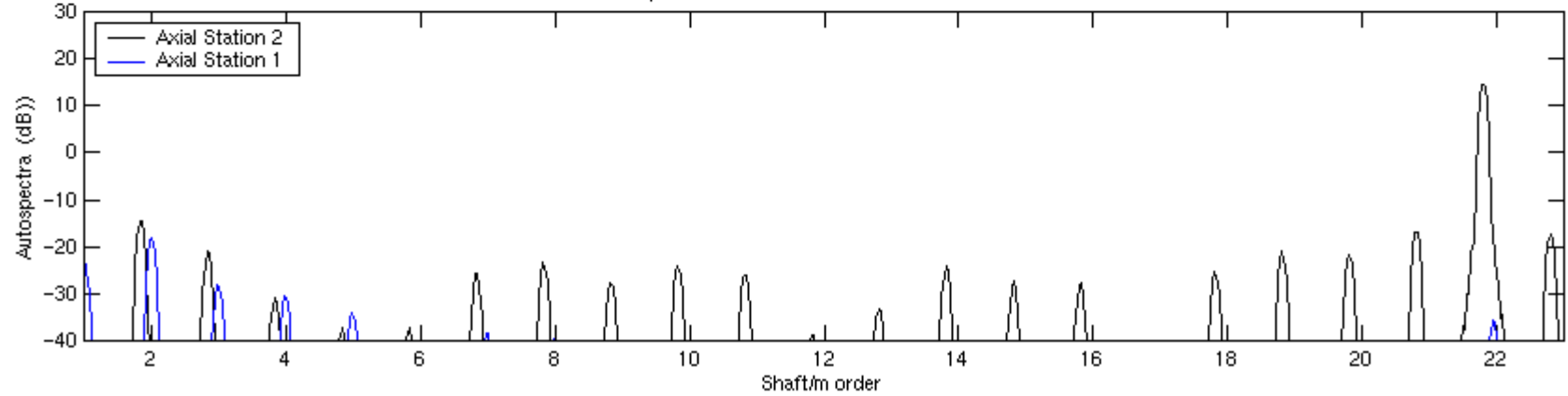


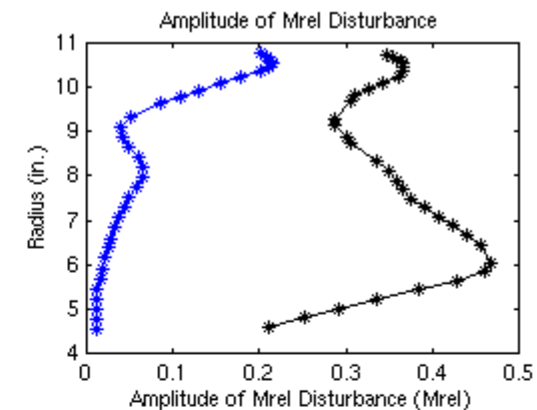
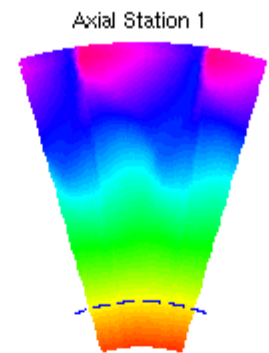
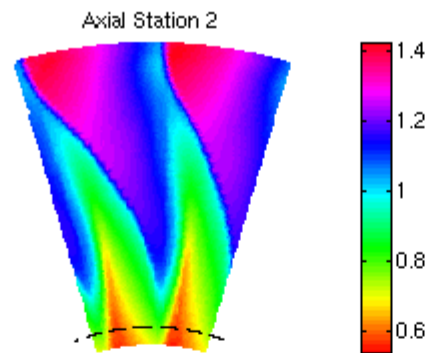
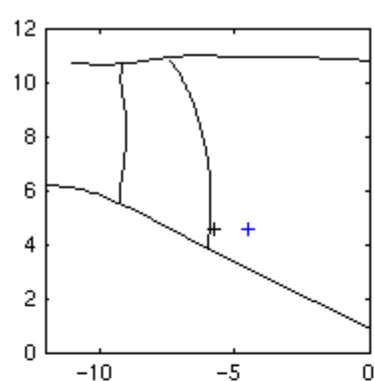


Relative Mach Number Distribution Across Rotor Rev

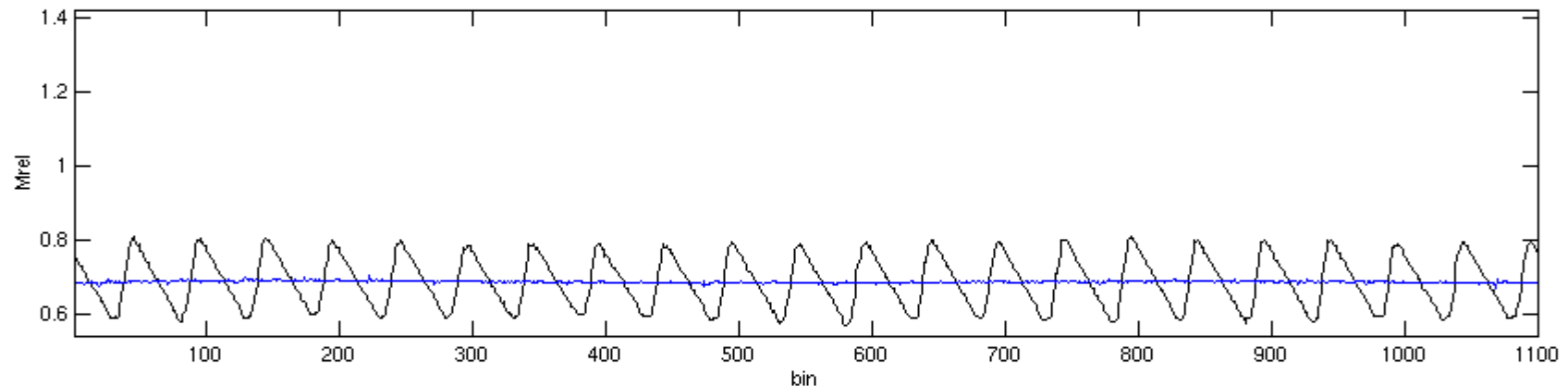


Autospectra of Relative Mach Number Distributions

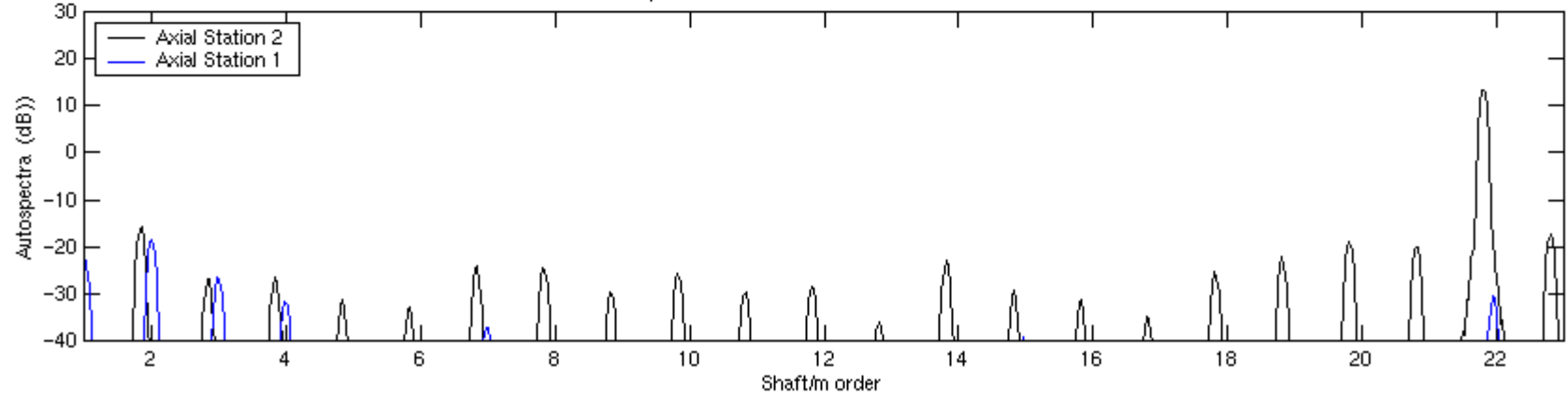


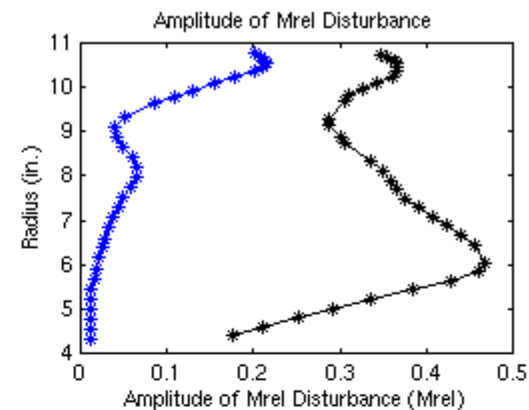
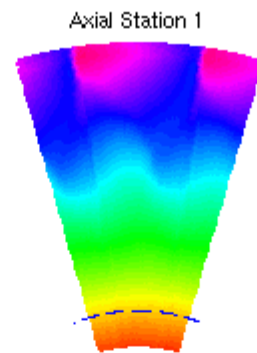
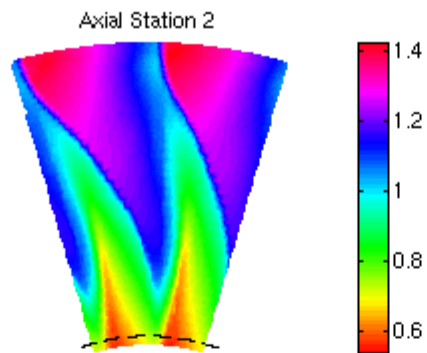
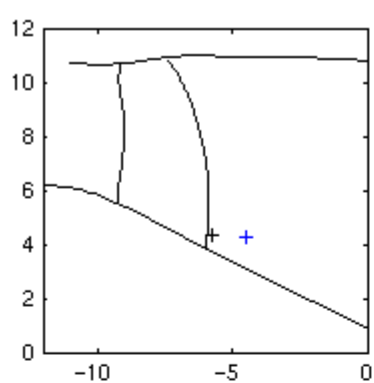


Relative Mach Number Distribution Across Rotor Rev

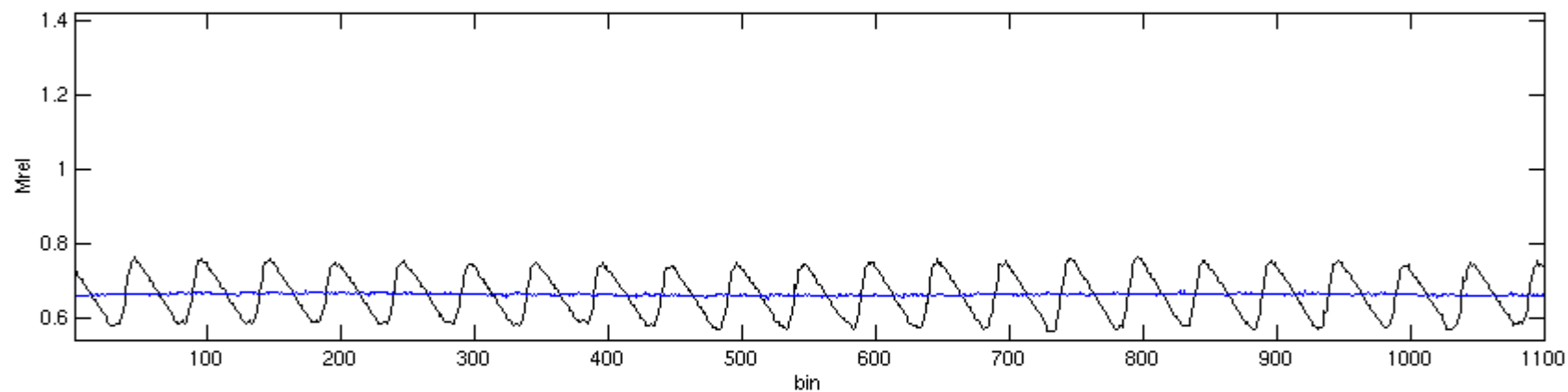


Autospectra of Relative Mach Number Distributions

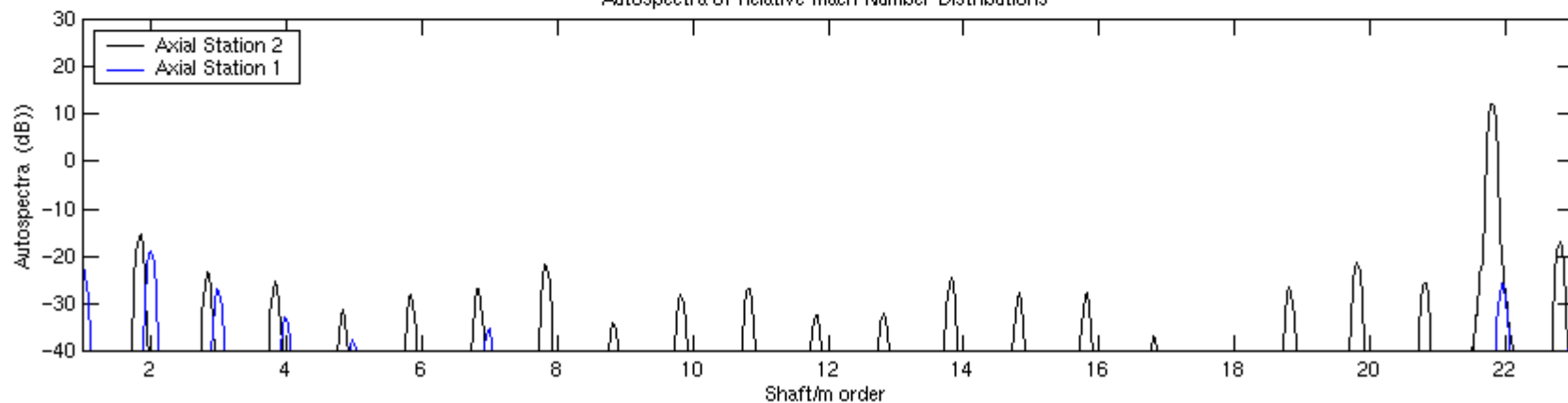


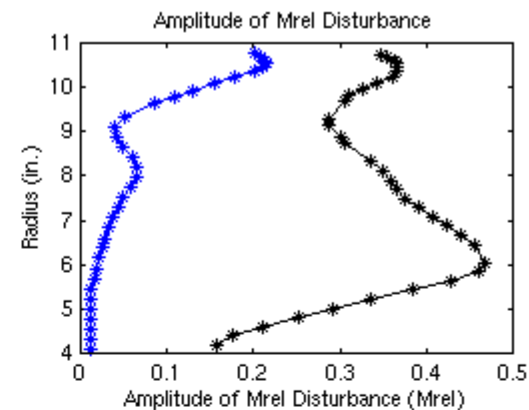
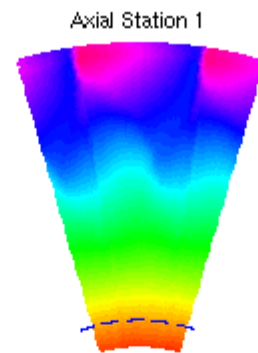
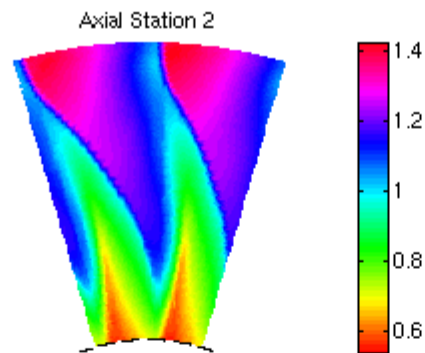
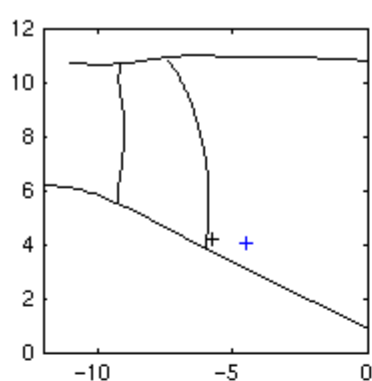


Relative Mach Number Distribution Across Rotor Rev

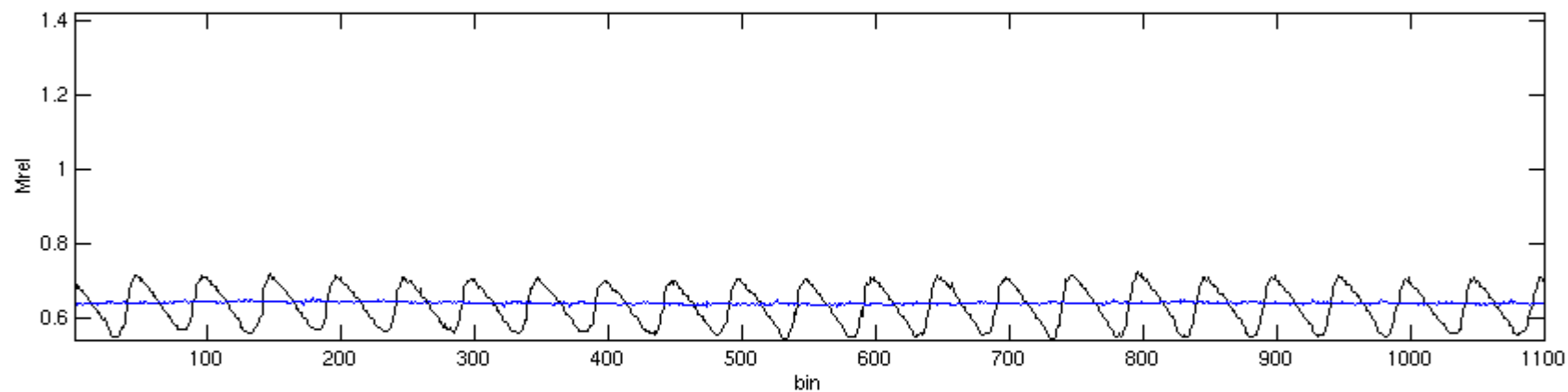


Autospectra of Relative Mach Number Distributions





Relative Mach Number Distribution Across Rotor Rev



Autospectra of Relative Mach Number Distributions

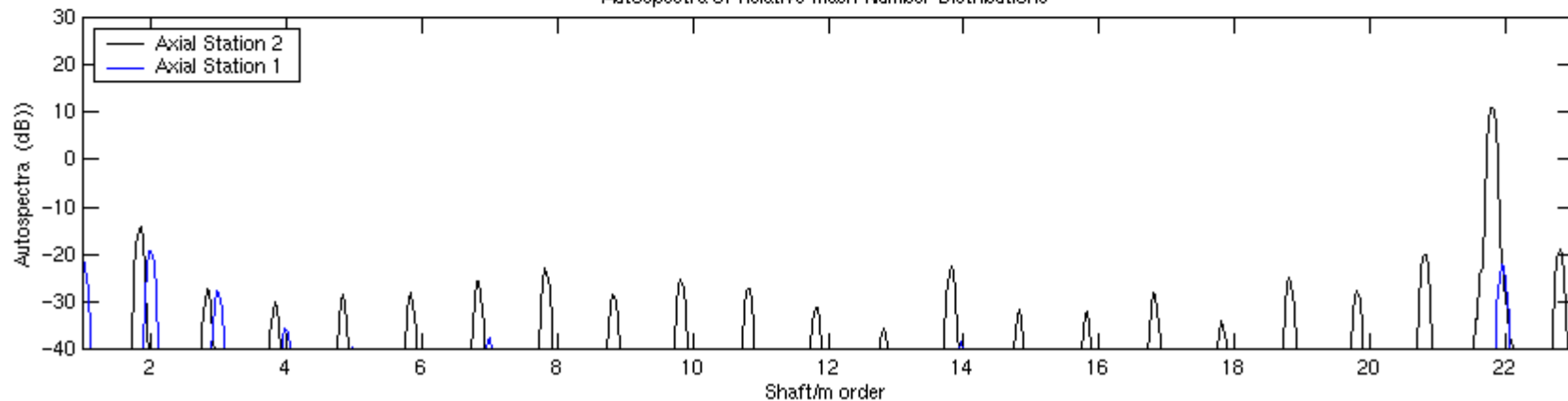


Figure 21.—The schematic at the left shows the measurement locations at which the data presented in figures 22 to 24 were obtained. Constant radial surveys were made at $r = 10.6, 8.5, 7.0,$ and 5.5 in. with the rotor operating at the high speed condition. The plot at the right shows where these radial surveys would cut through the flow measured at axial stations 1 and 2. The $r = 10.6$ in. location corresponds to where the upstream shock was at its maximum strength.

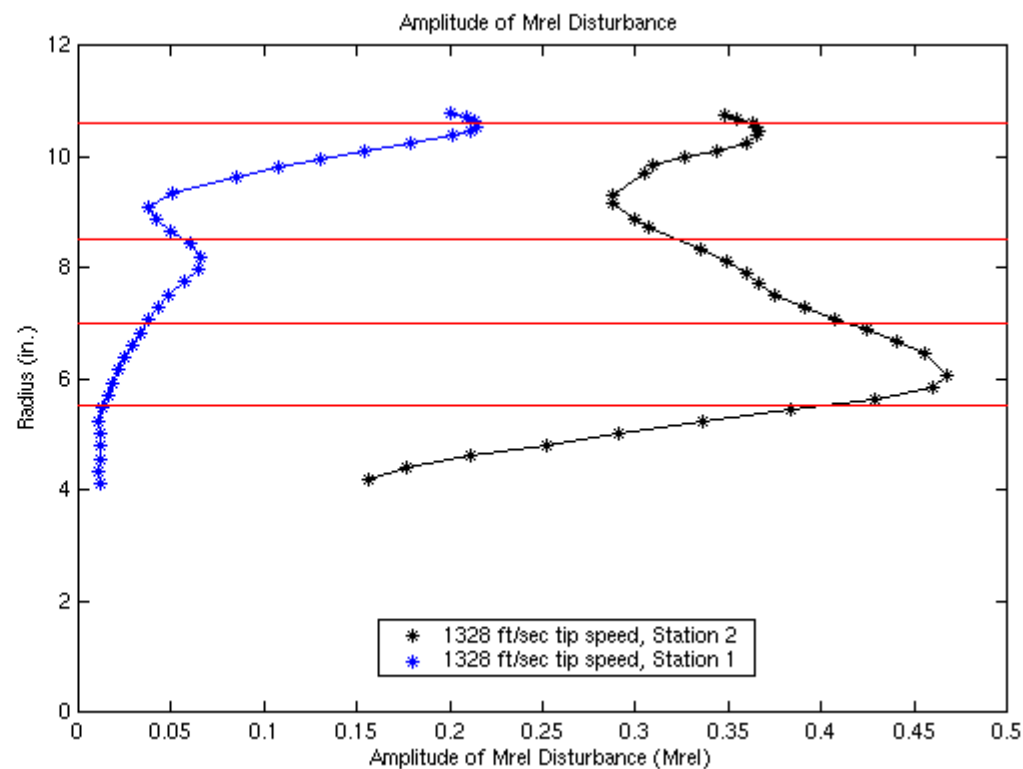
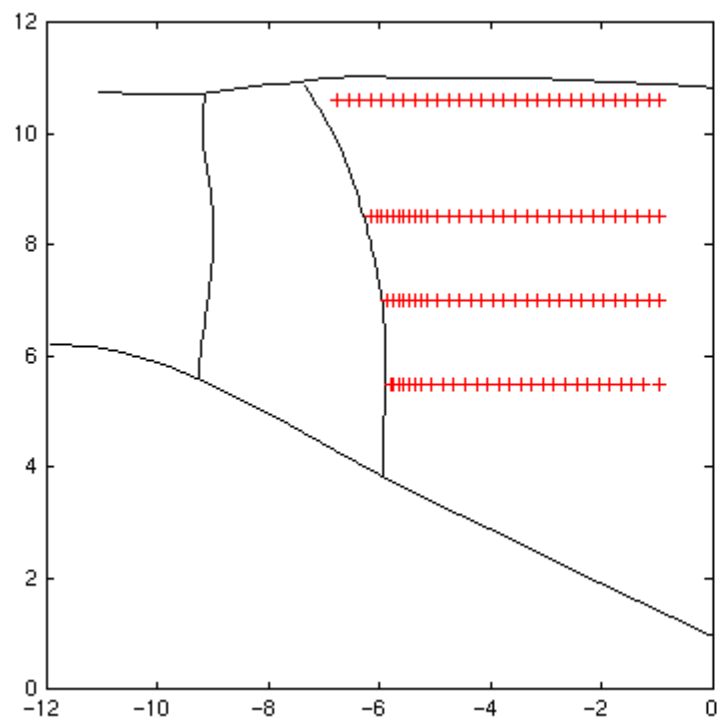
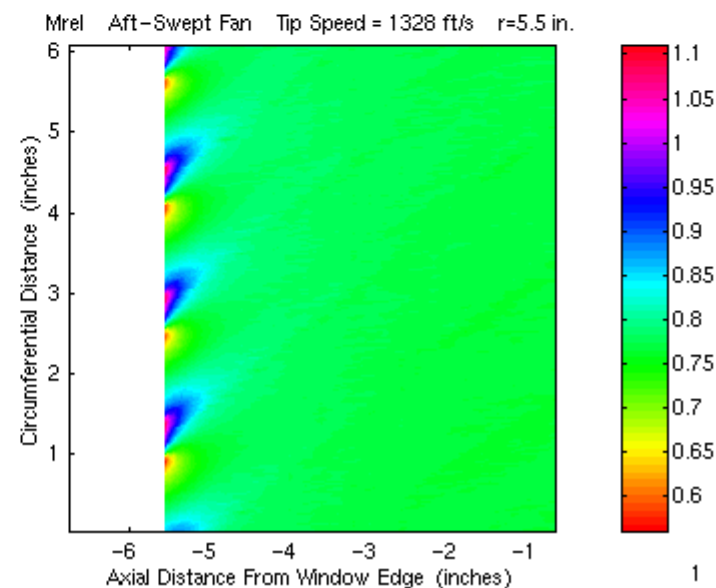
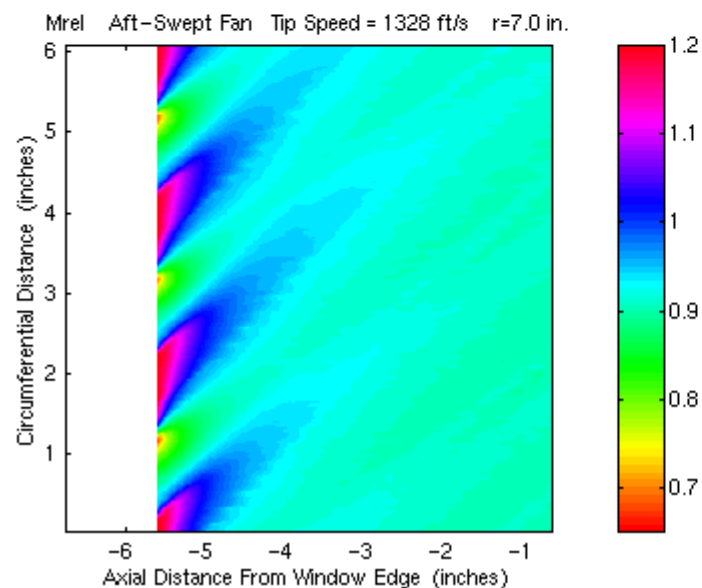
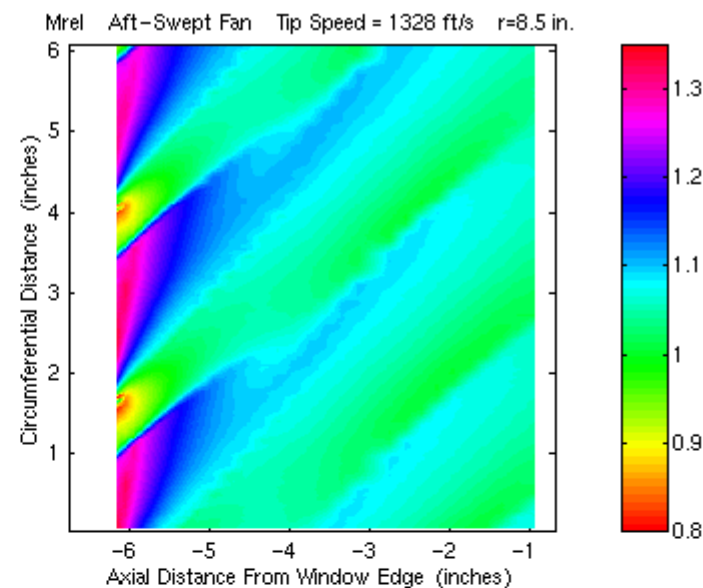
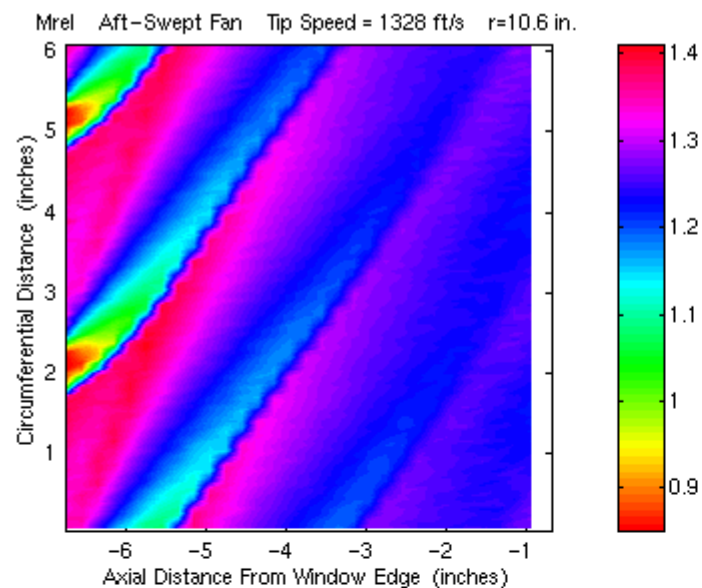
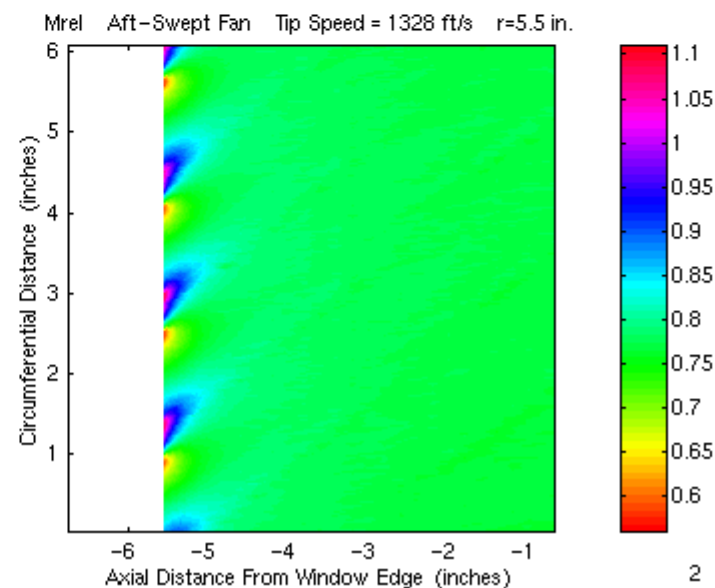
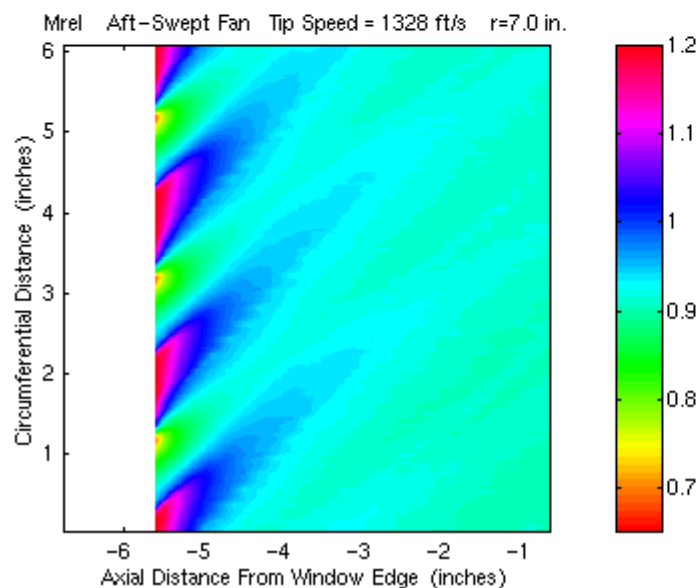
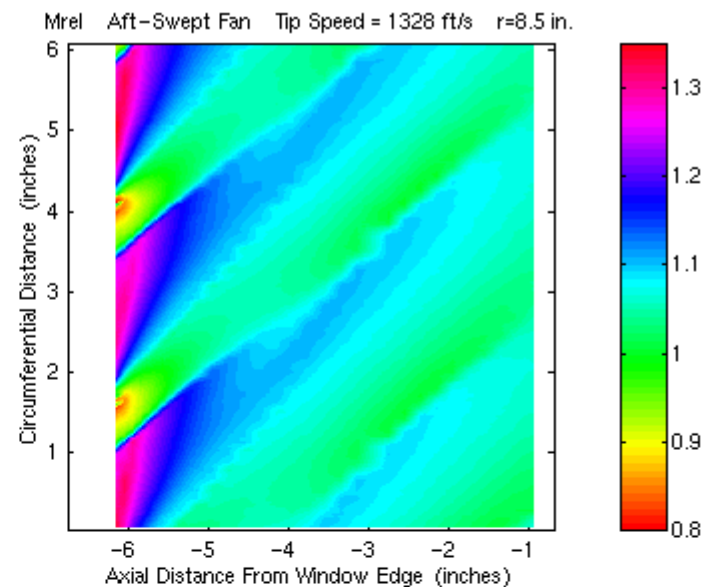
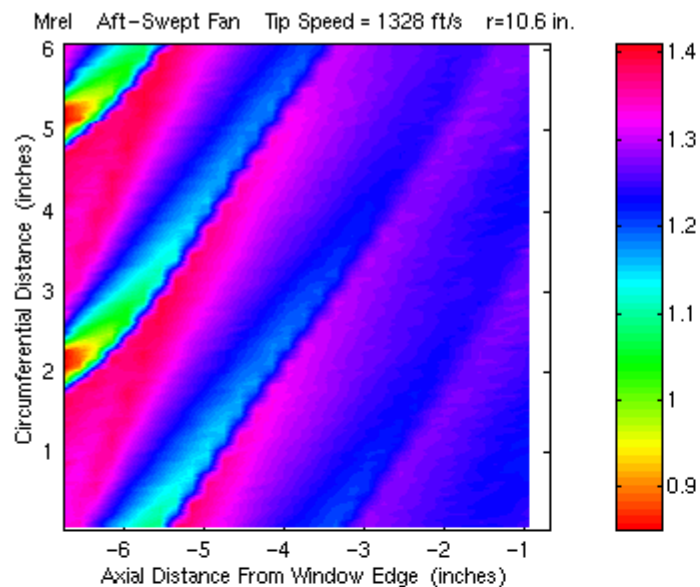
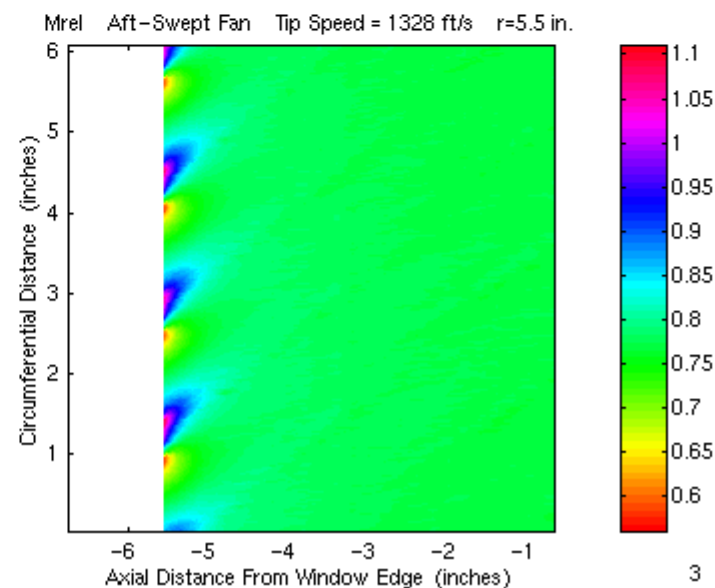
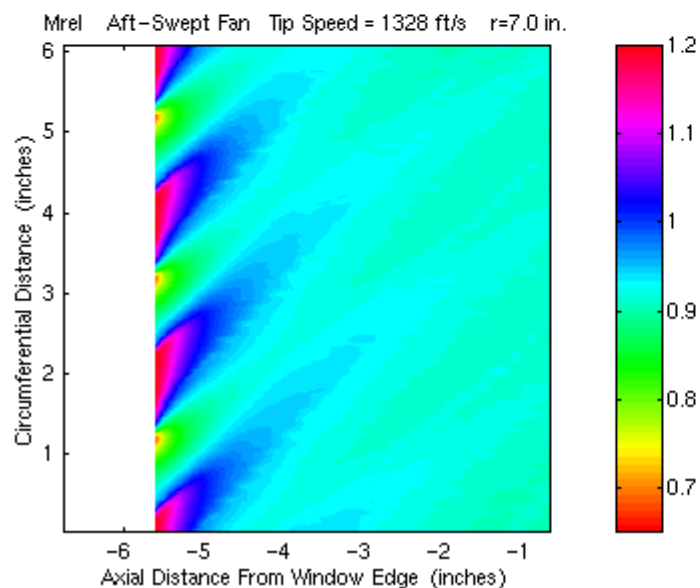
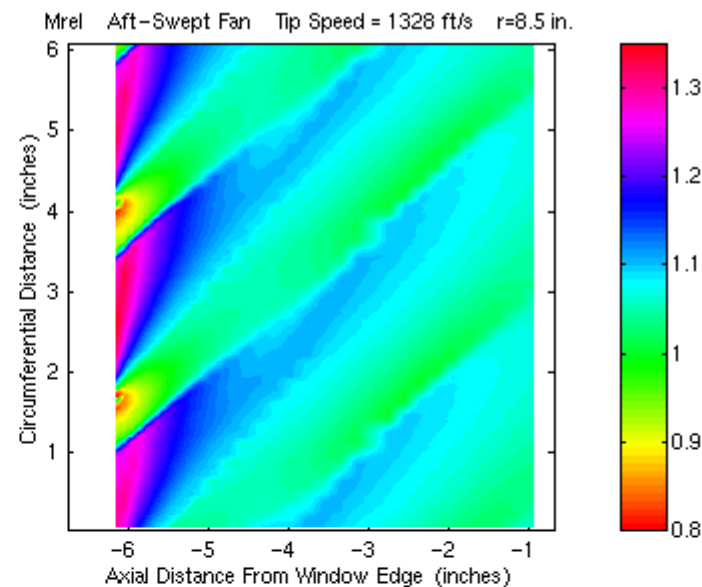
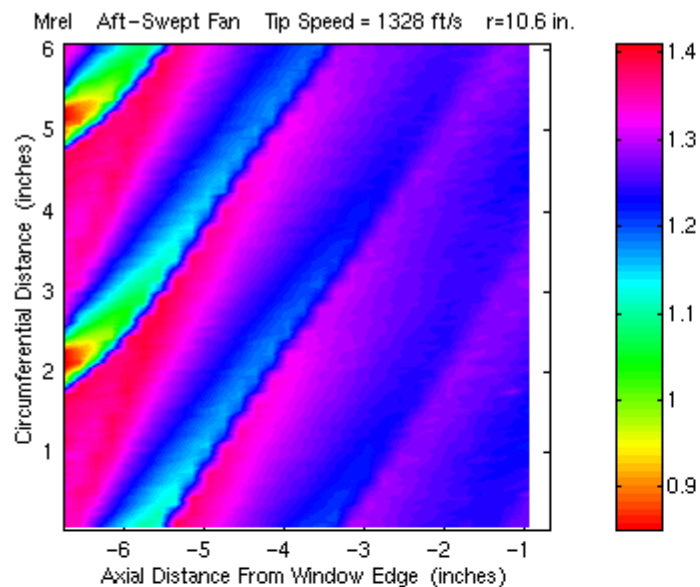
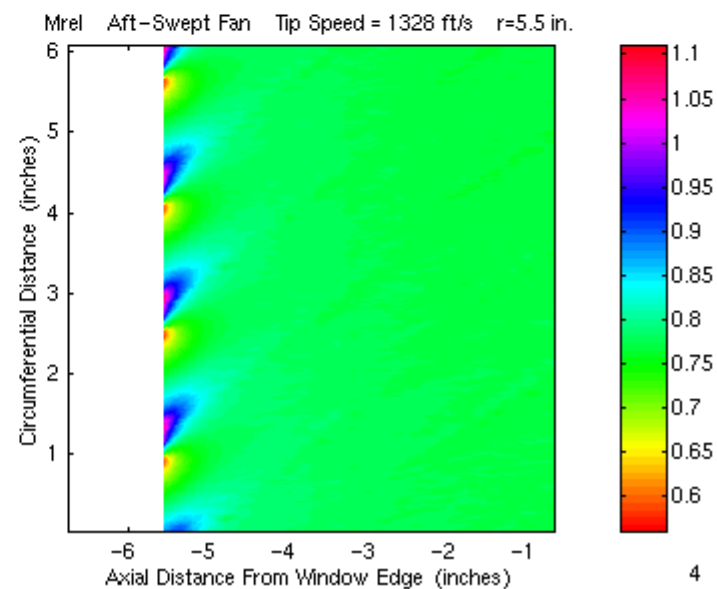
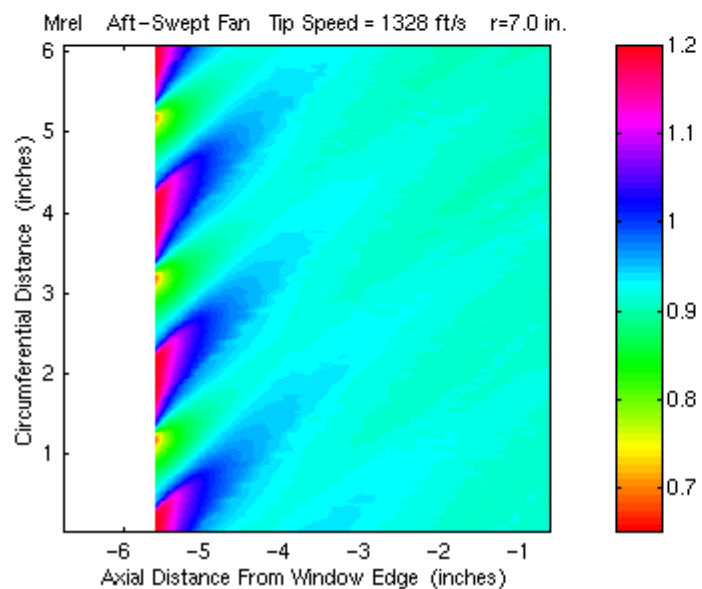
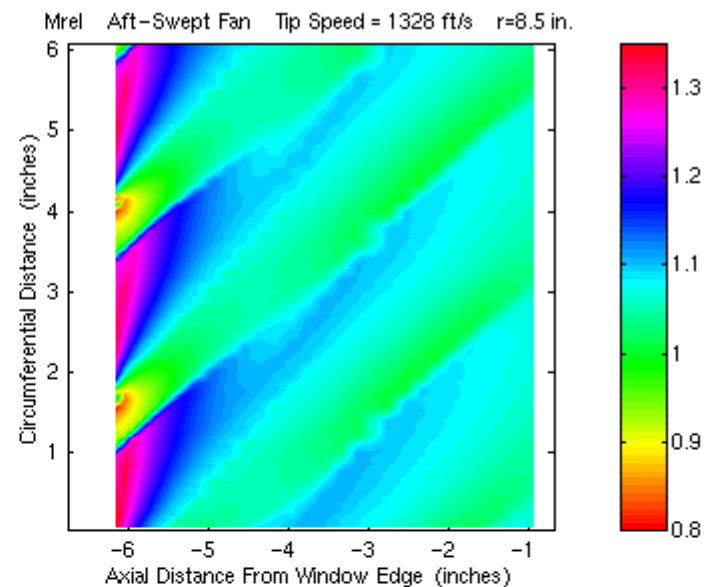
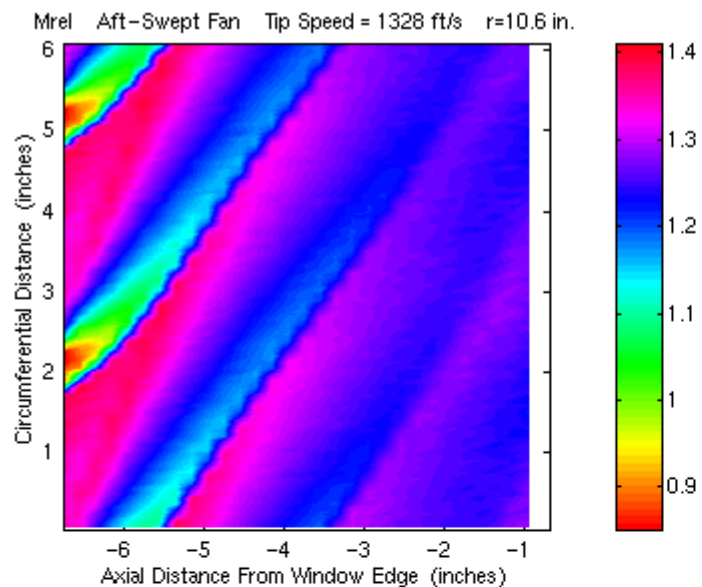


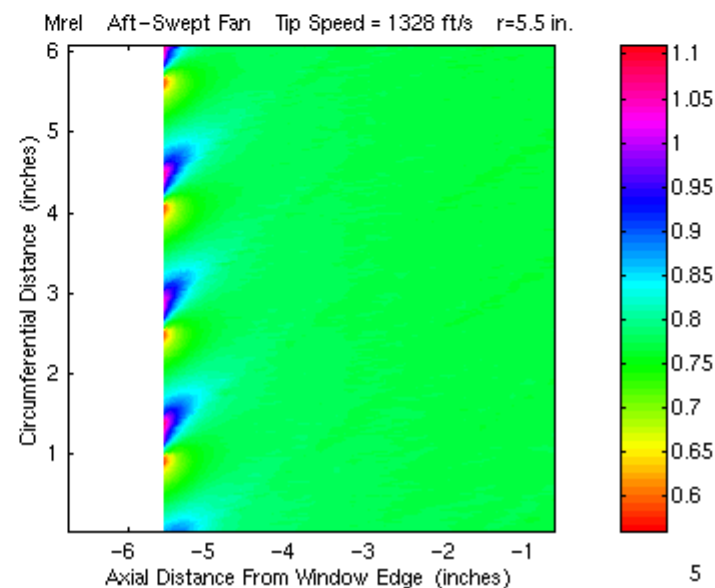
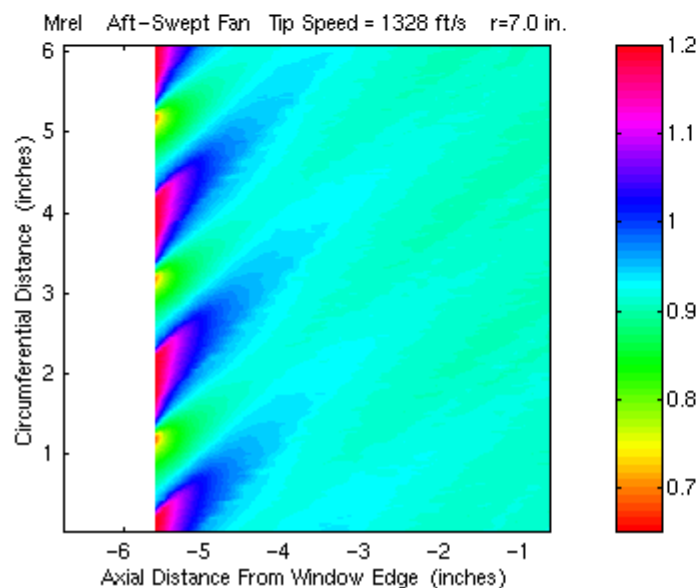
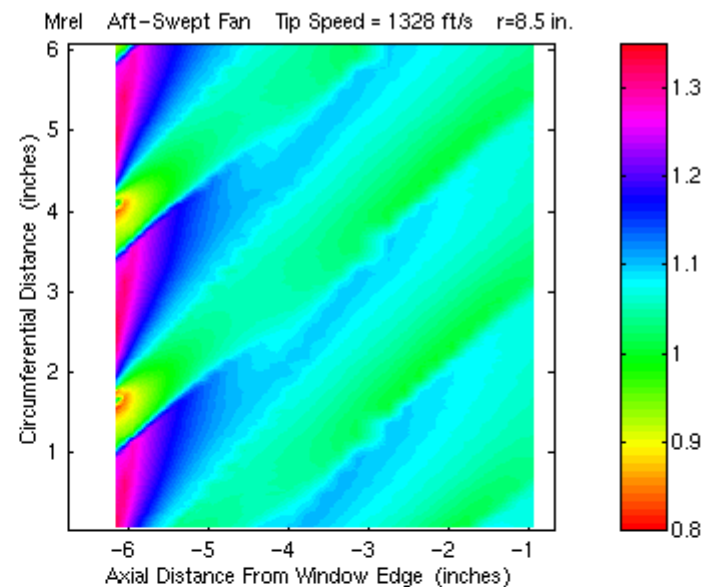
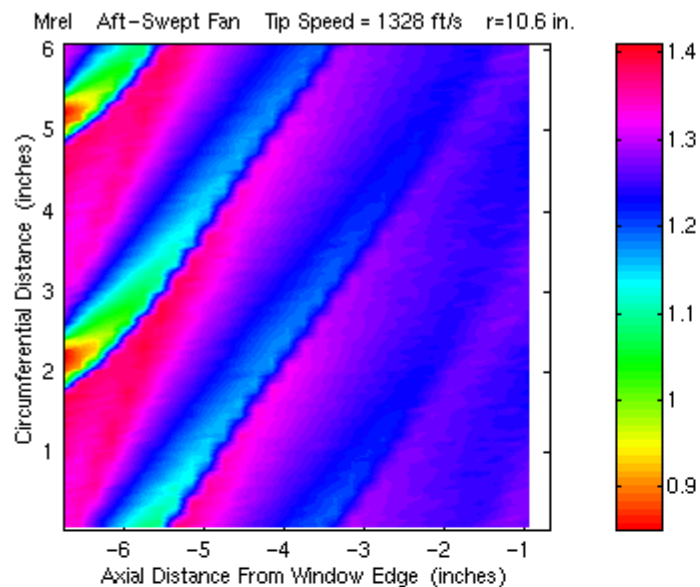
Figure 22.—Slideshow (22 slides) illustrating the blade-to-blade variations in the flow measured upstream of the aft-swept fan at $r = 10.6, 8.5, 7.0$ and 5.5 in. with the rotor operating at the high speed condition. On each successive slide a new blade passage of data is rotated into view.

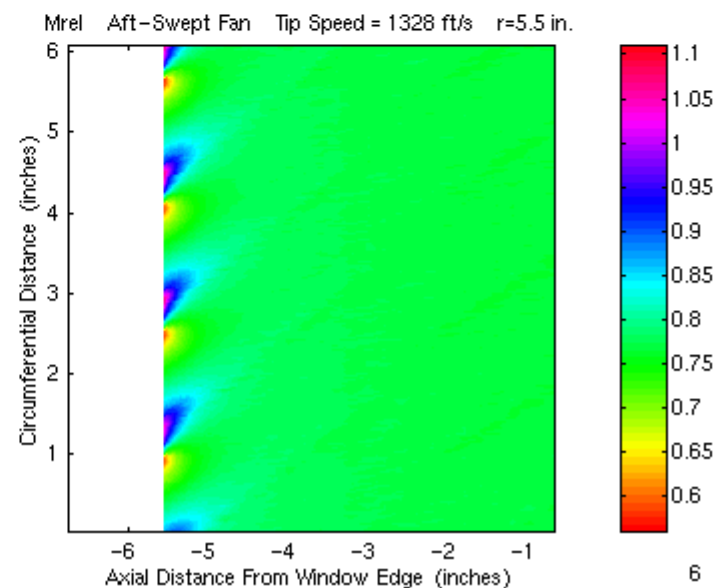
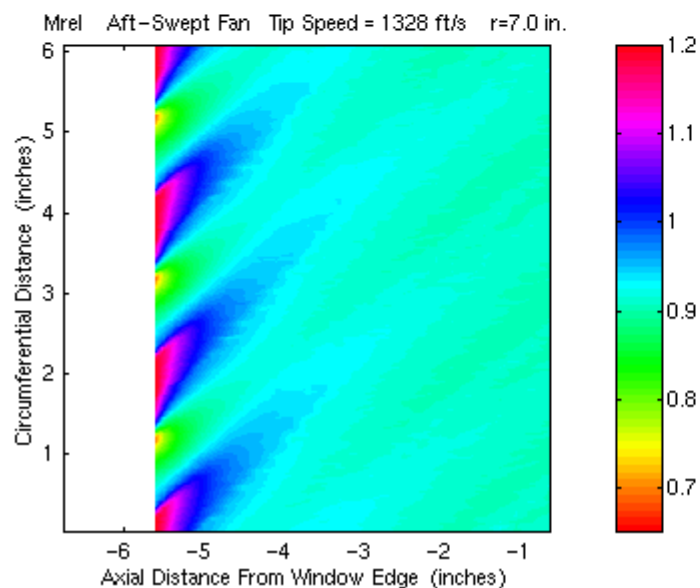
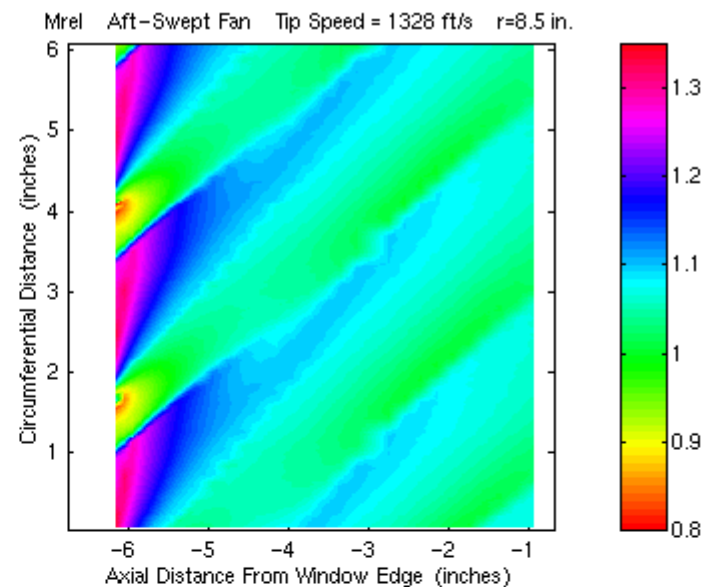
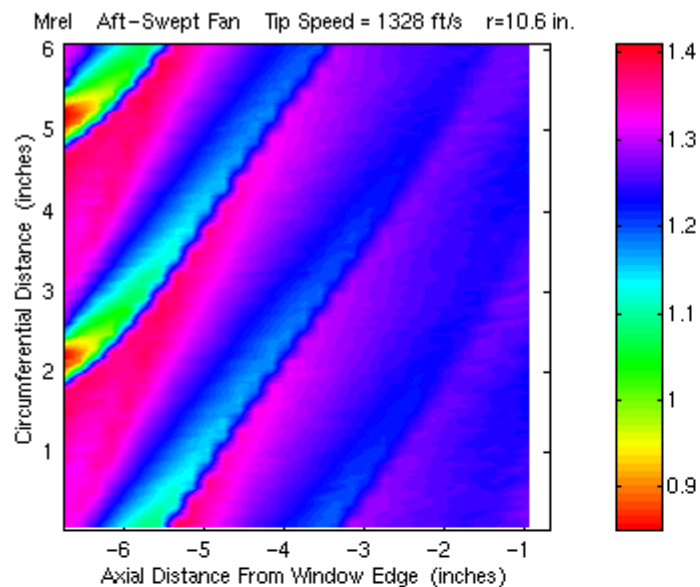


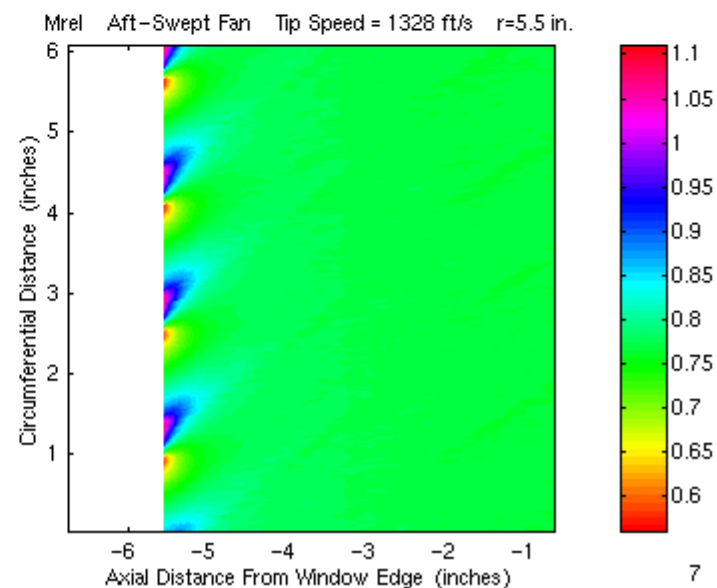
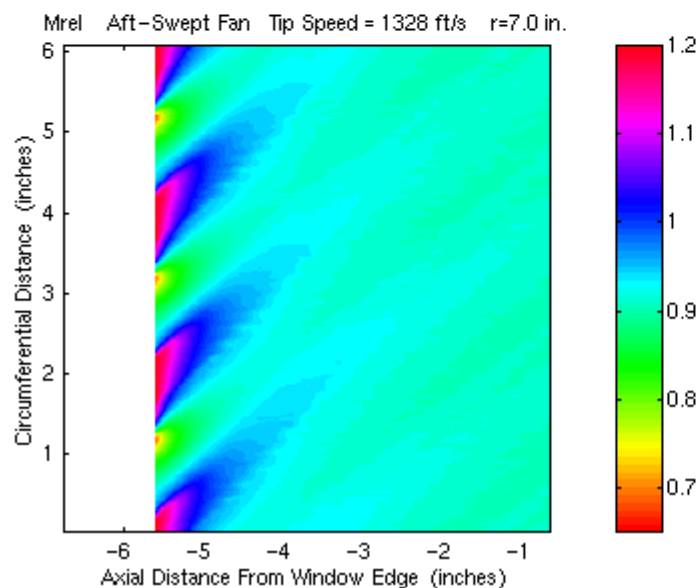
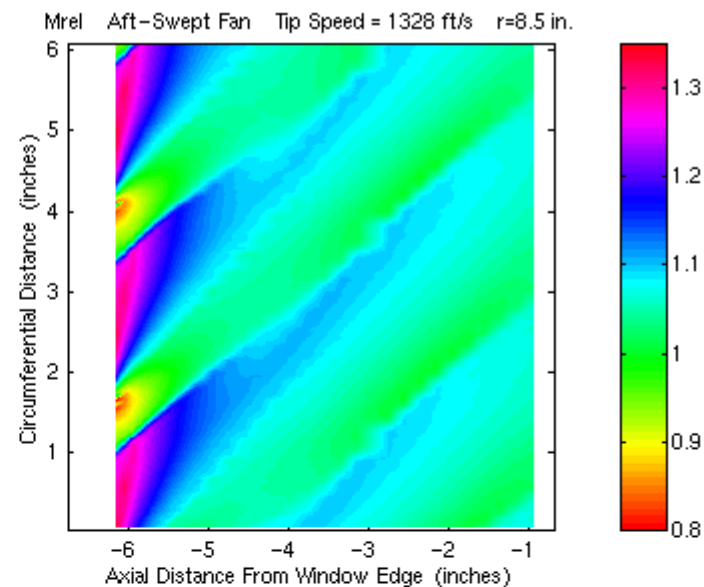
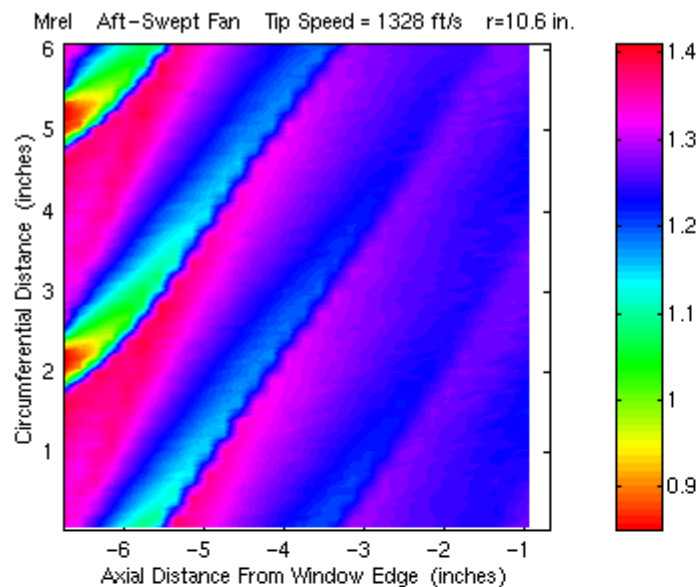


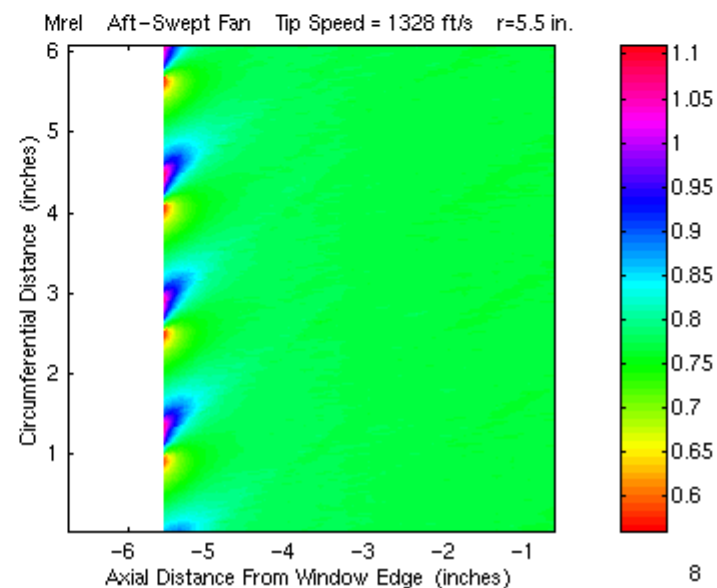
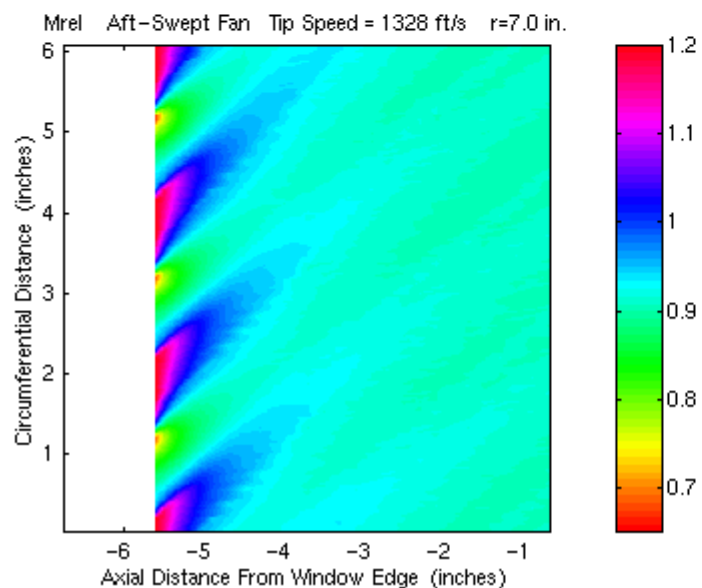
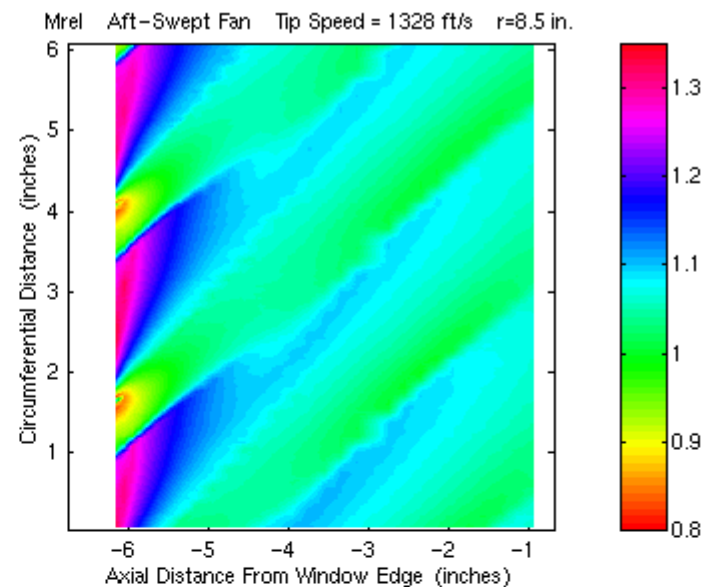
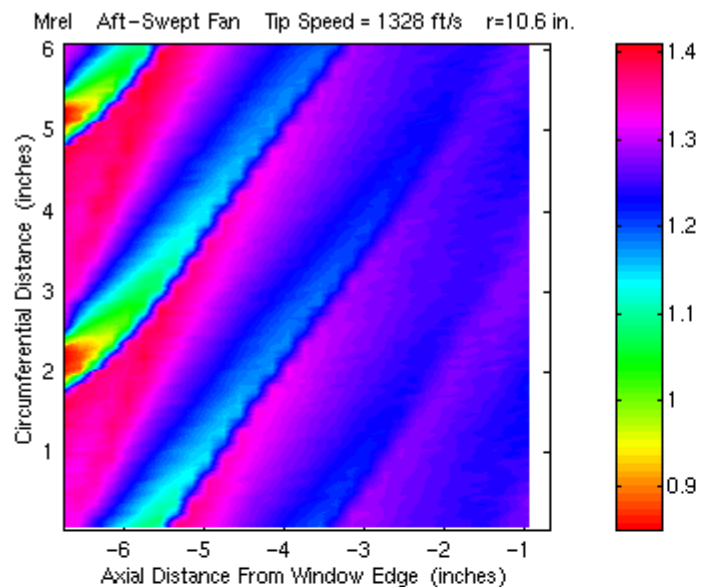


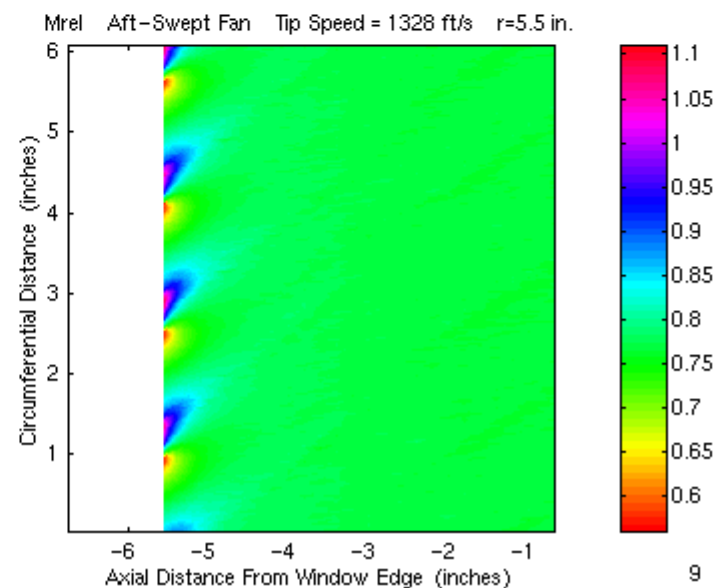
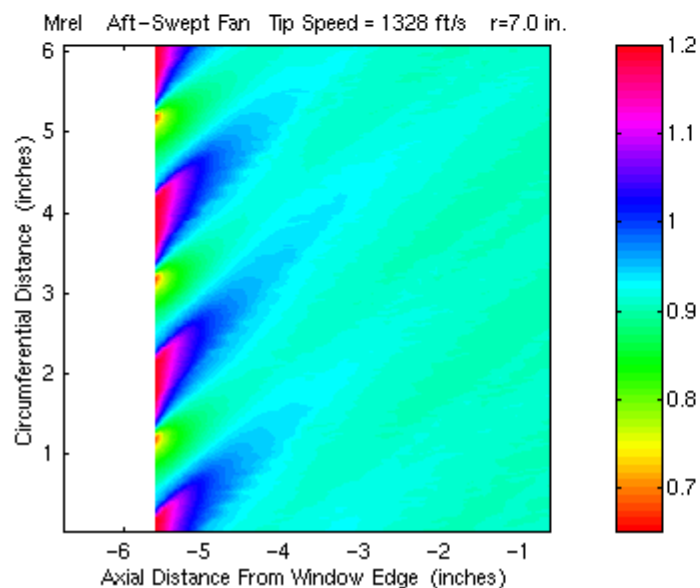
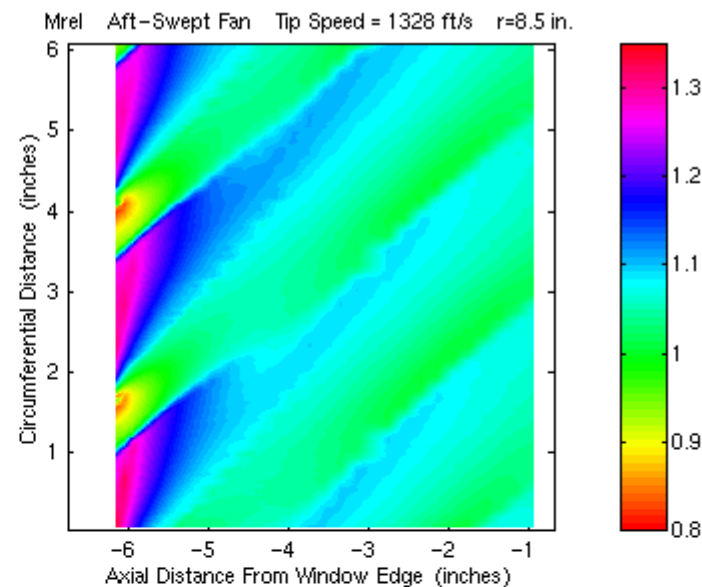
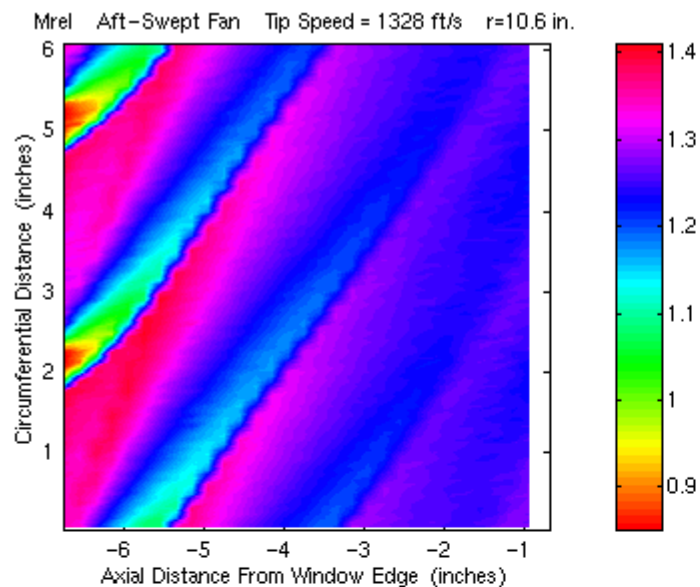


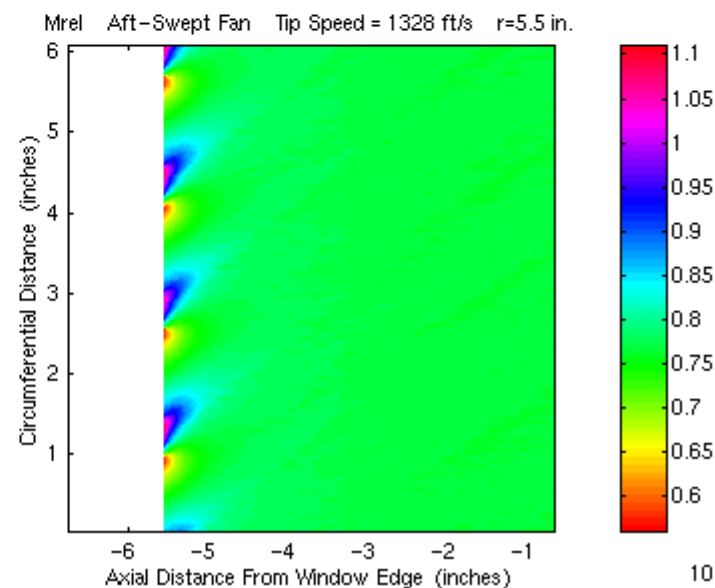
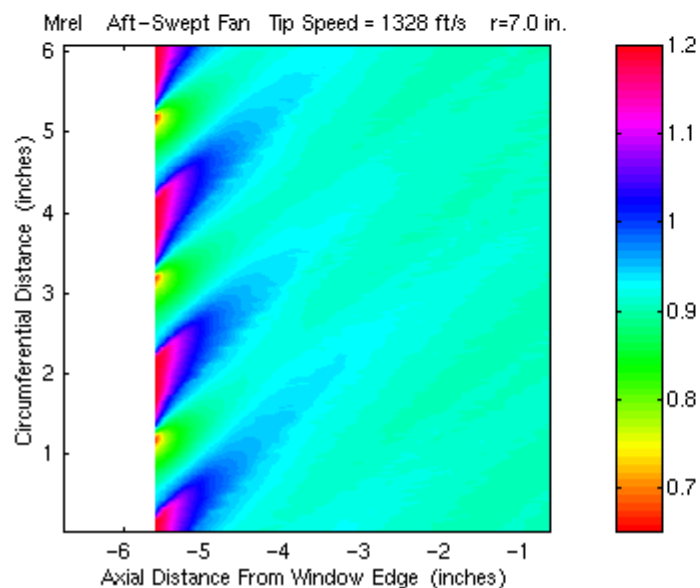
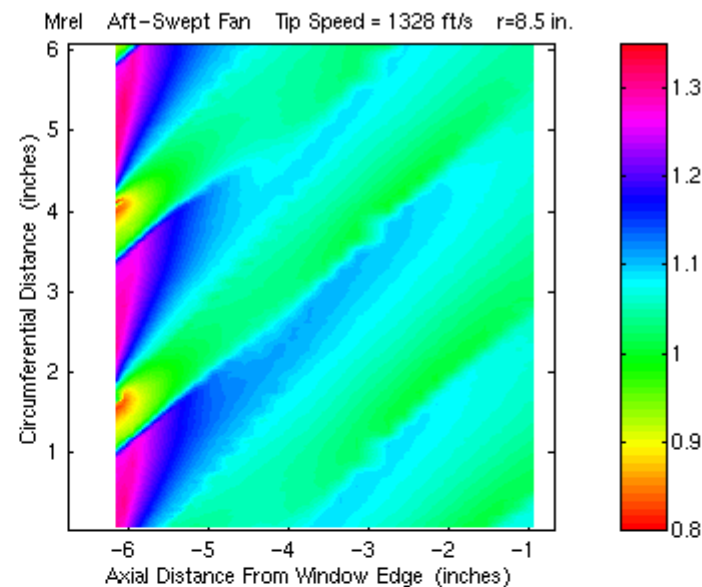
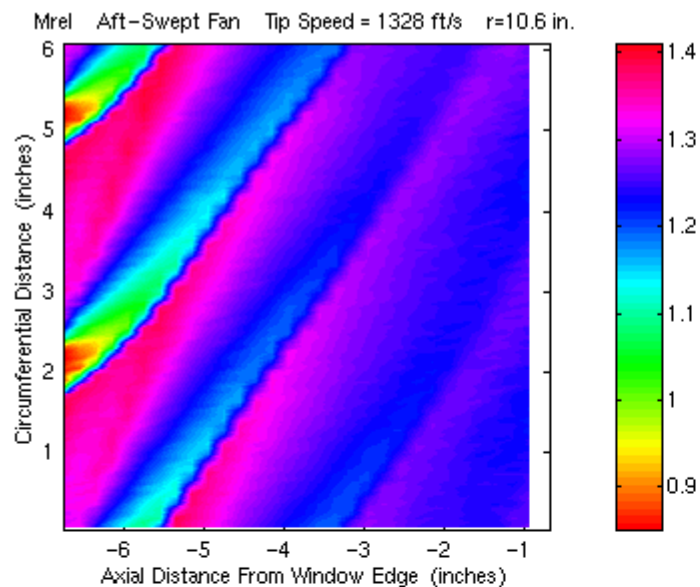


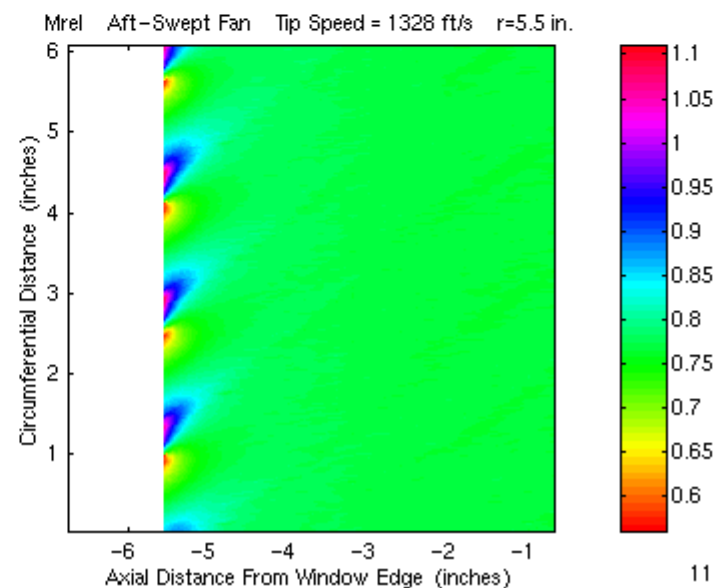
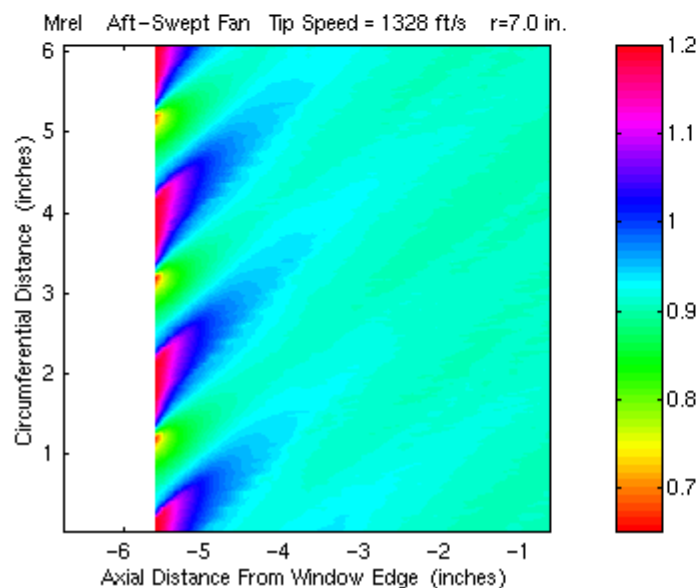
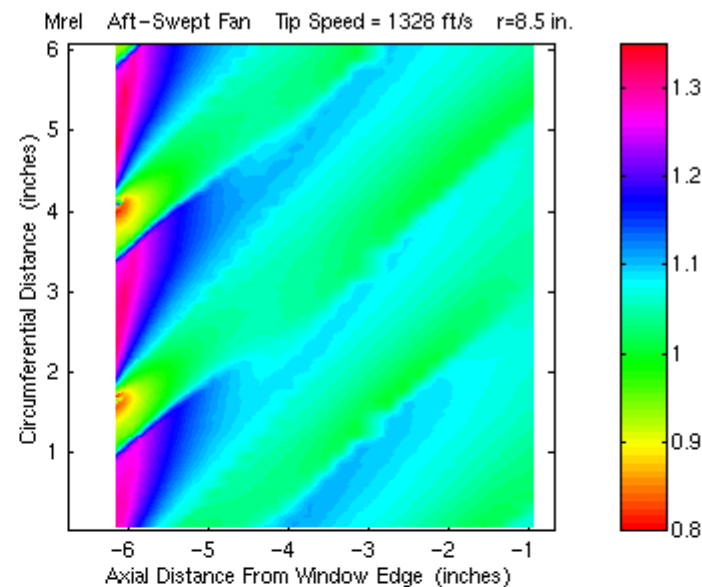
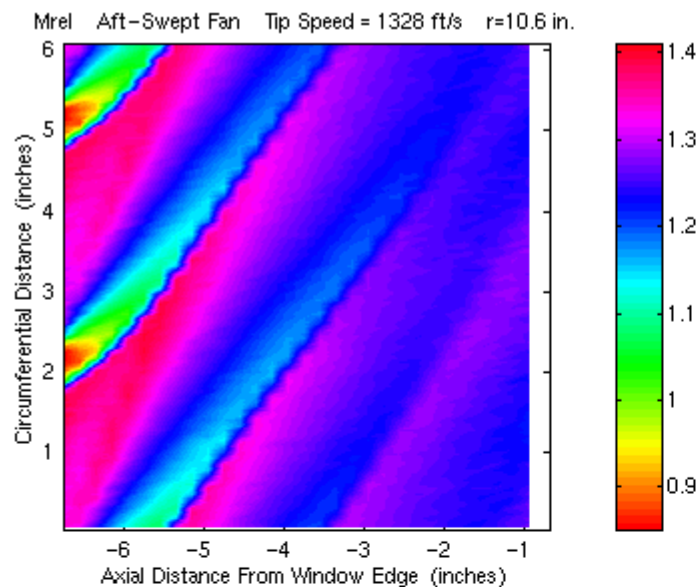


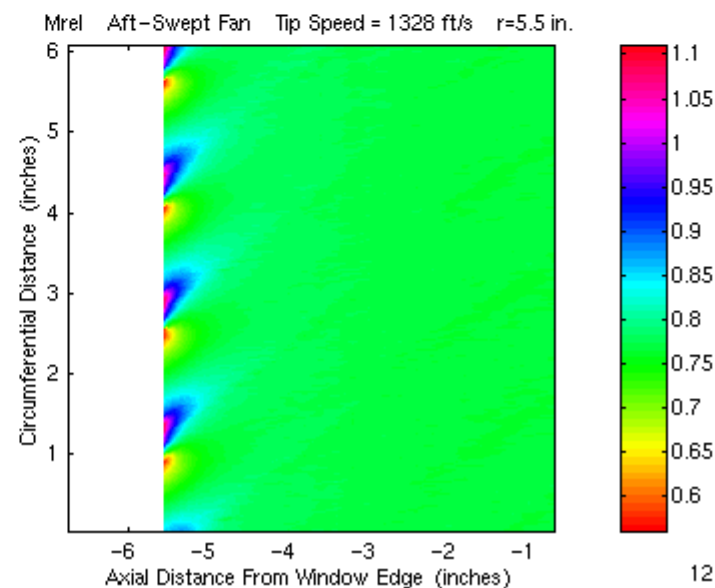
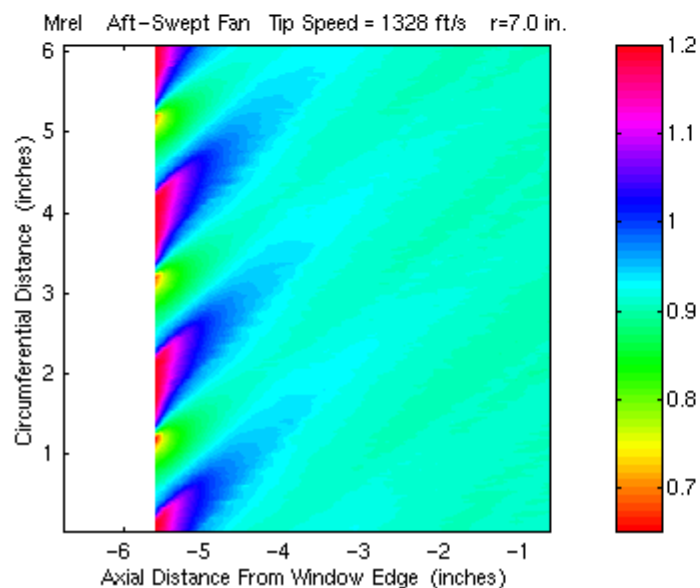
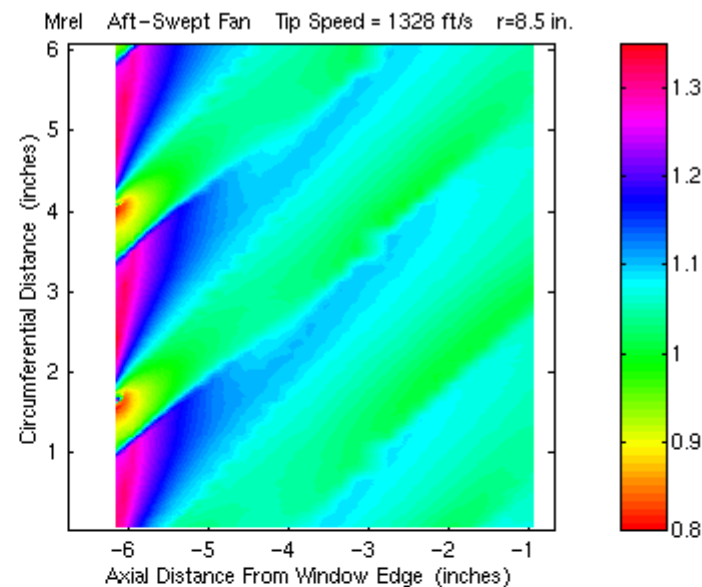
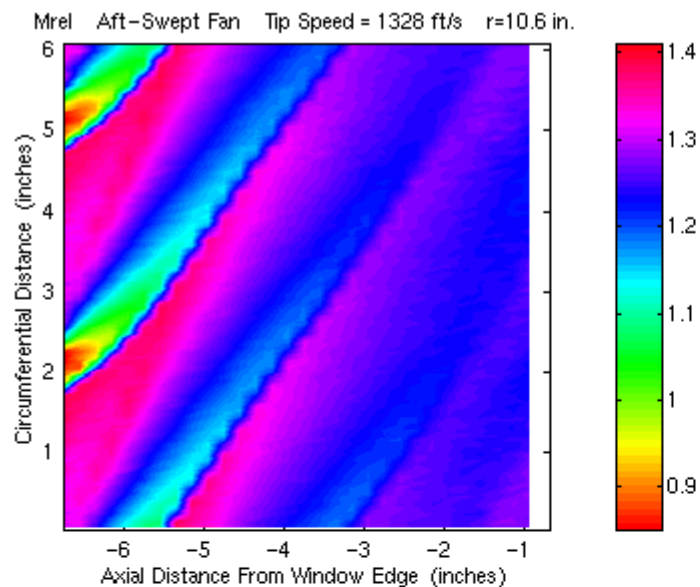


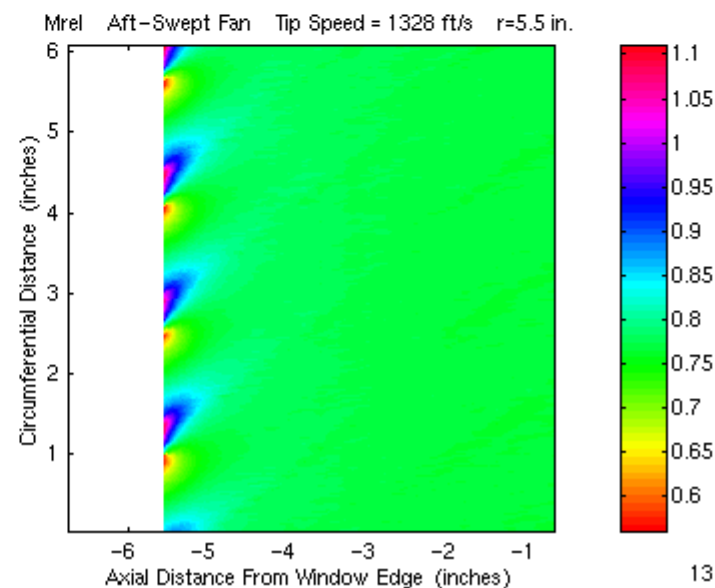
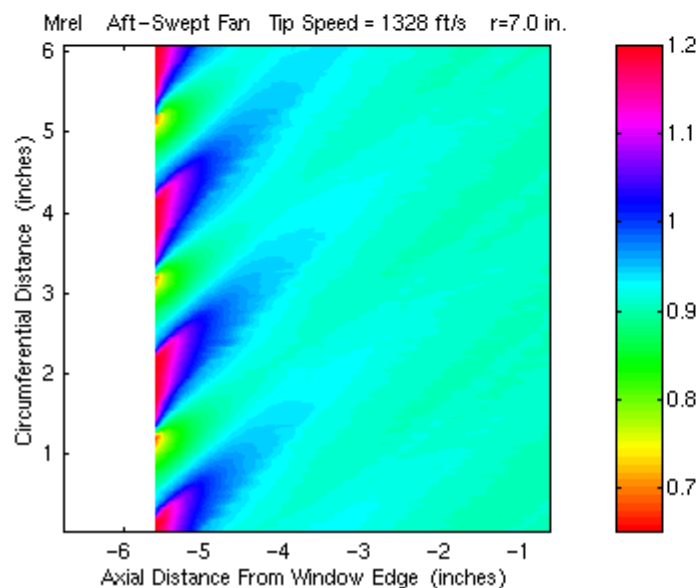
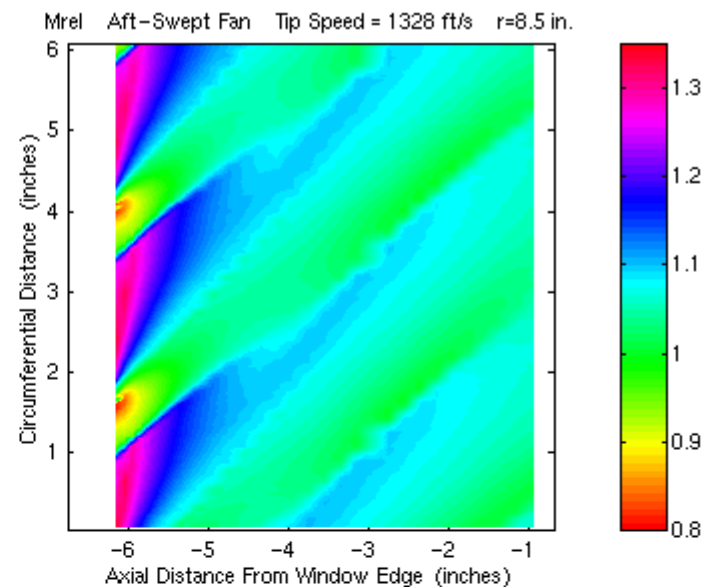
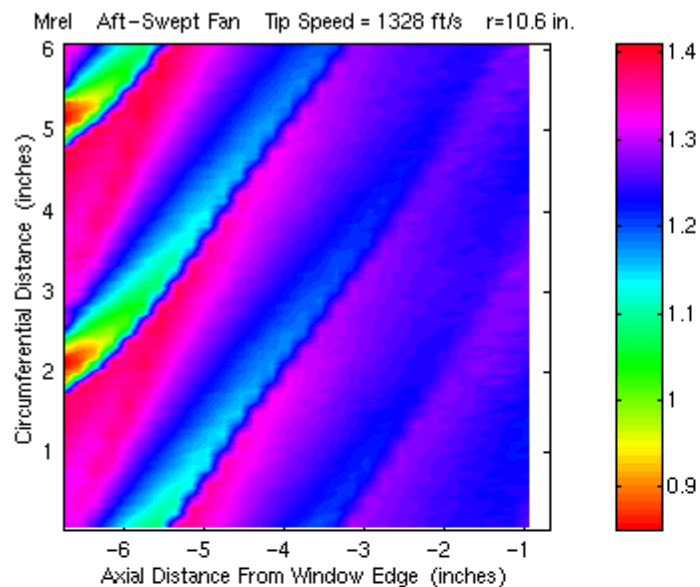


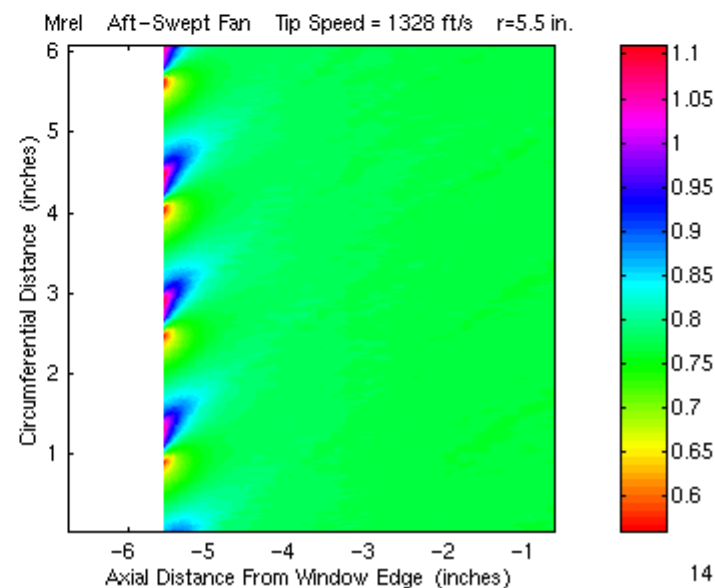
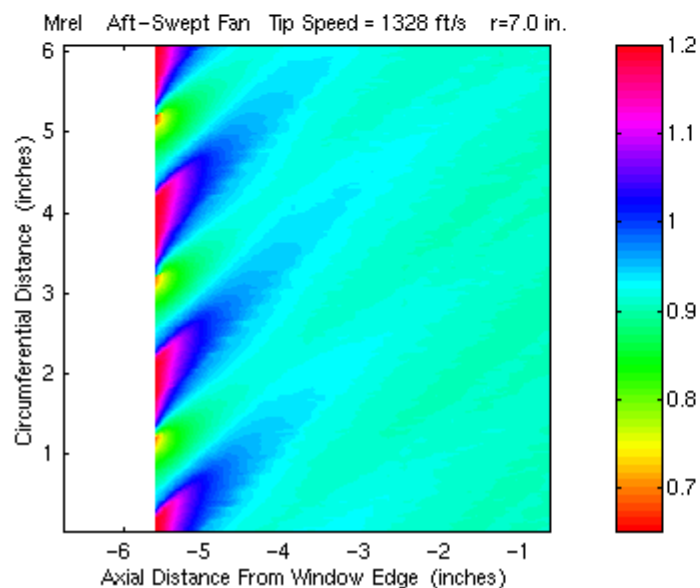
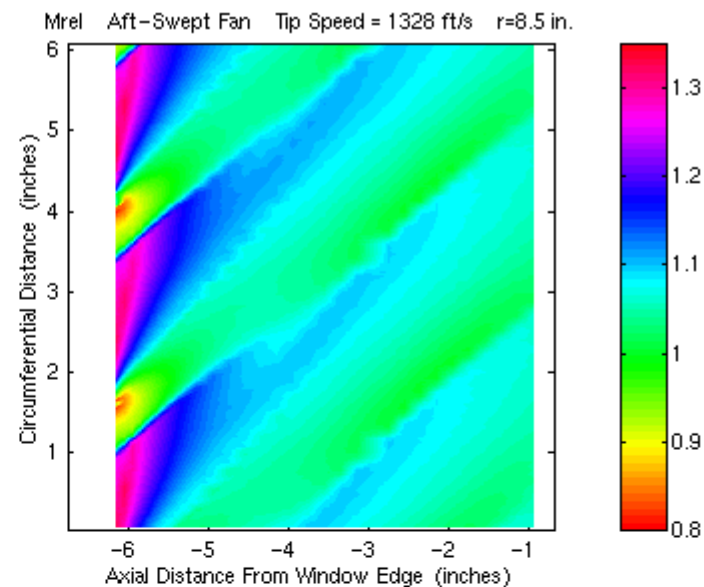
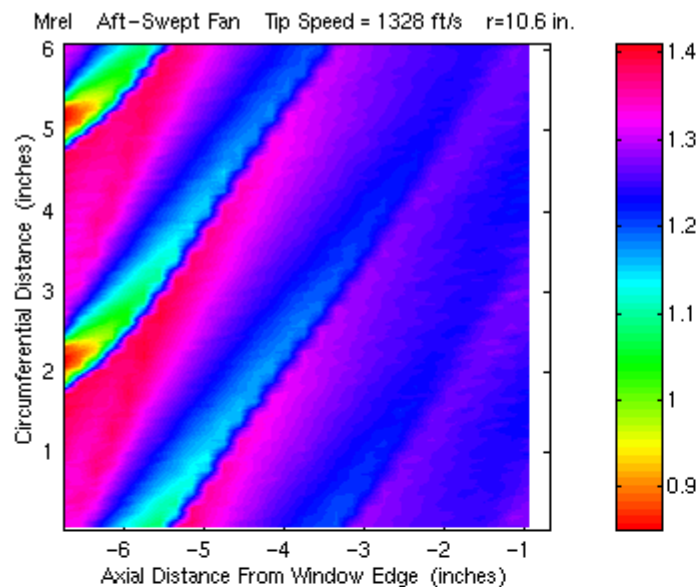


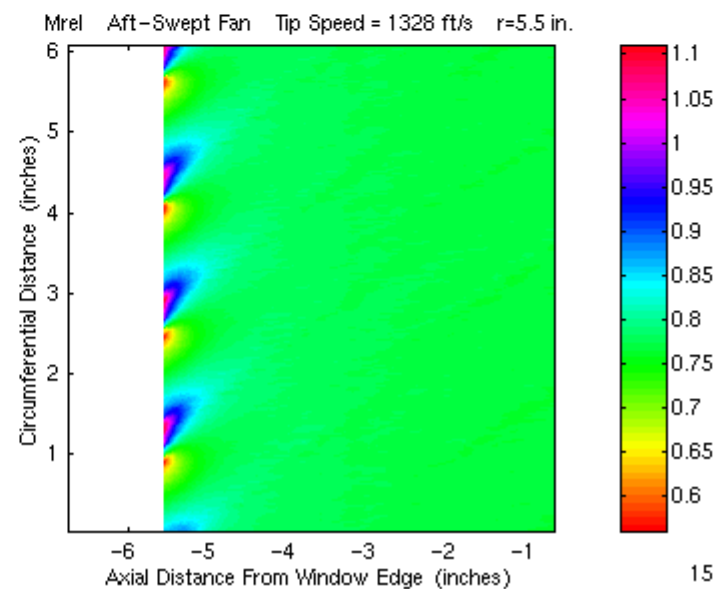
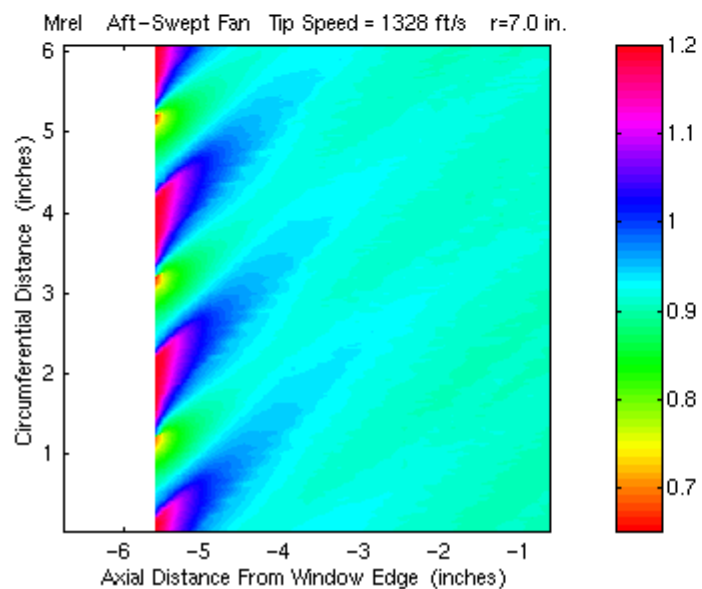
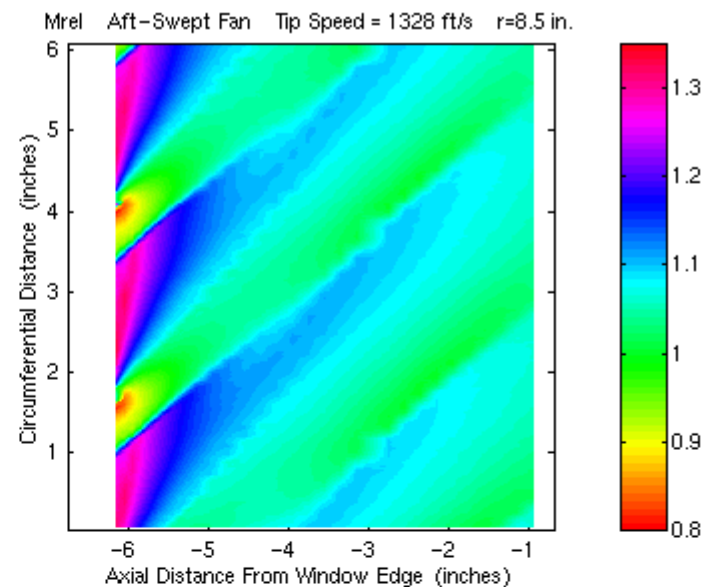
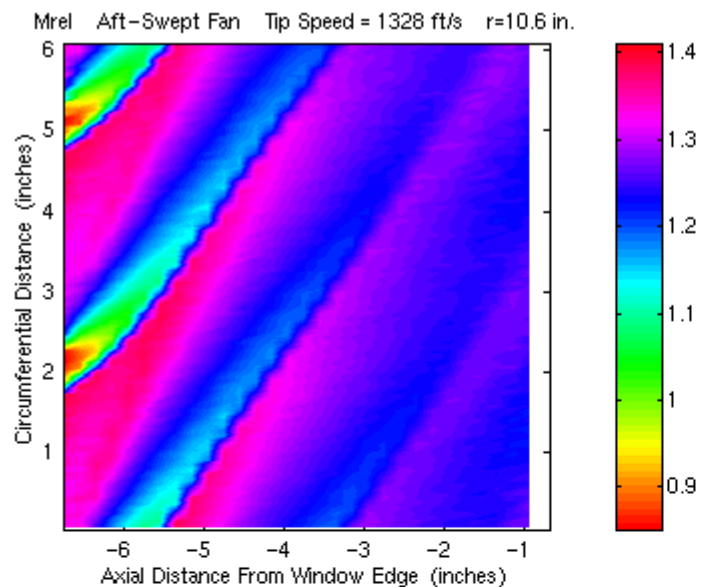


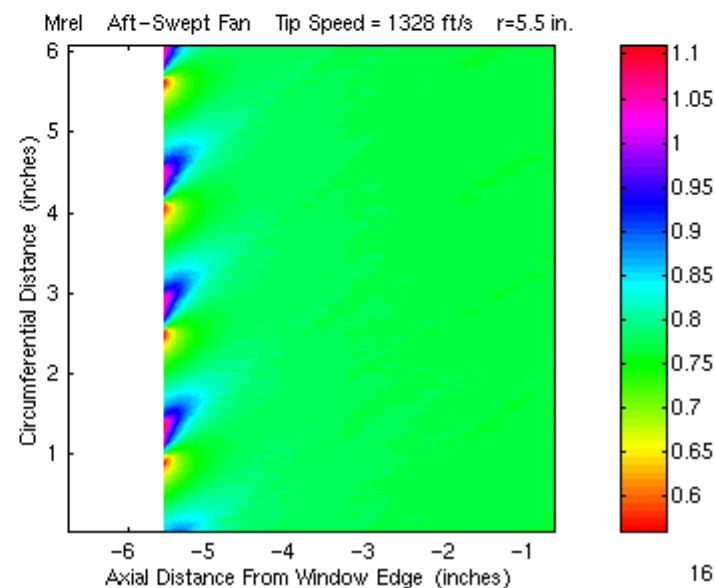
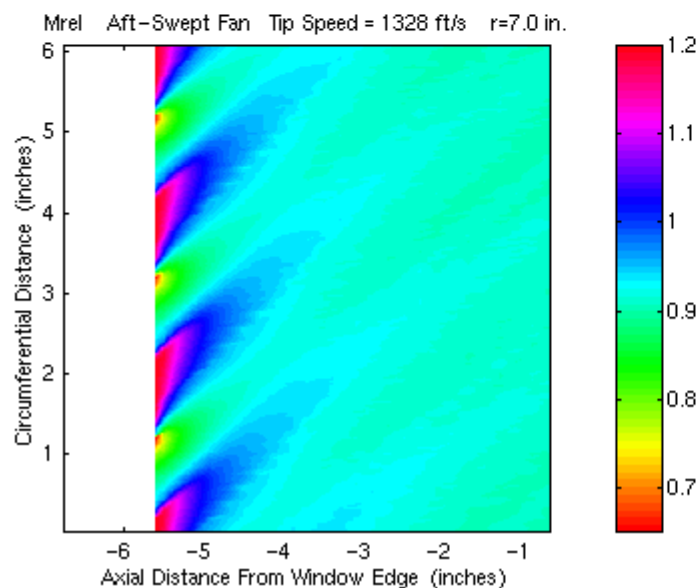
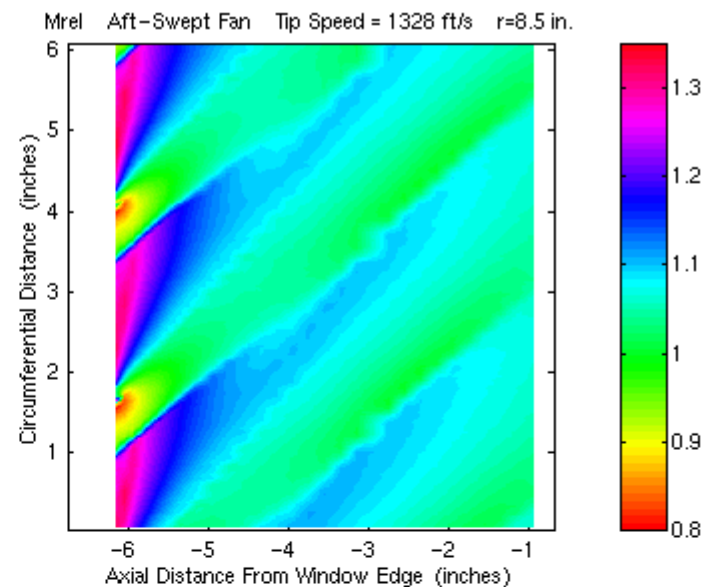
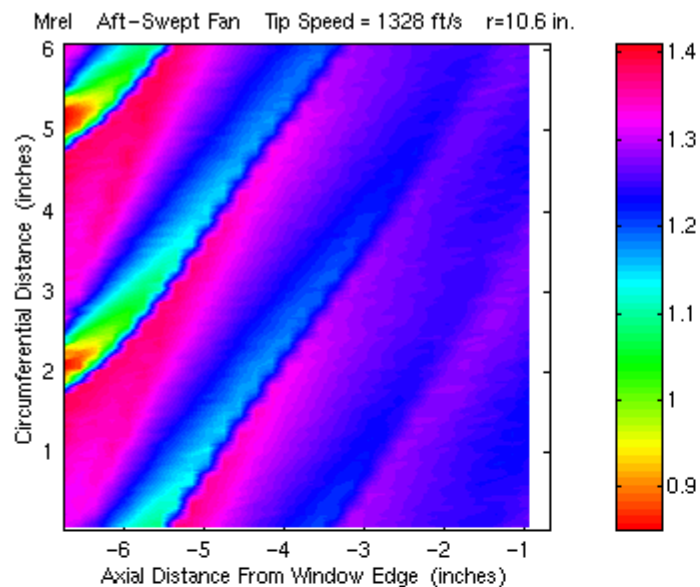


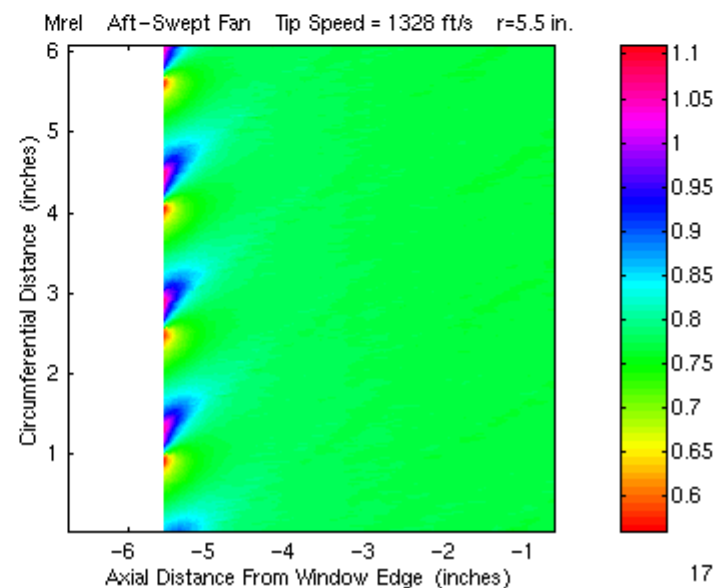
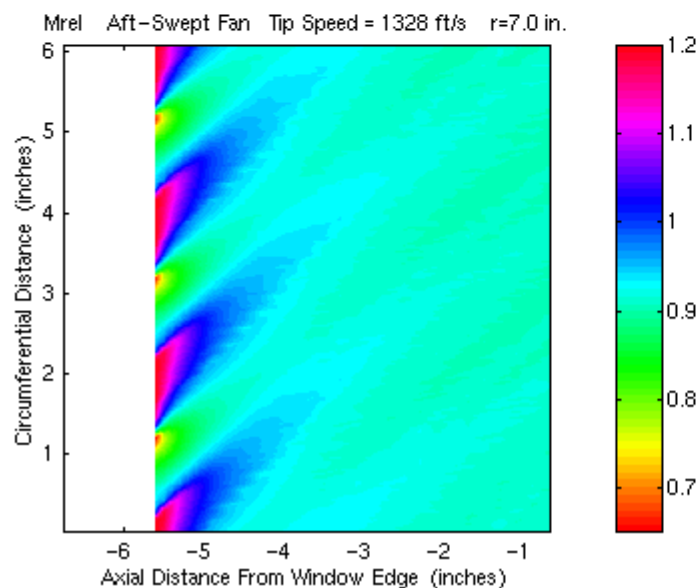
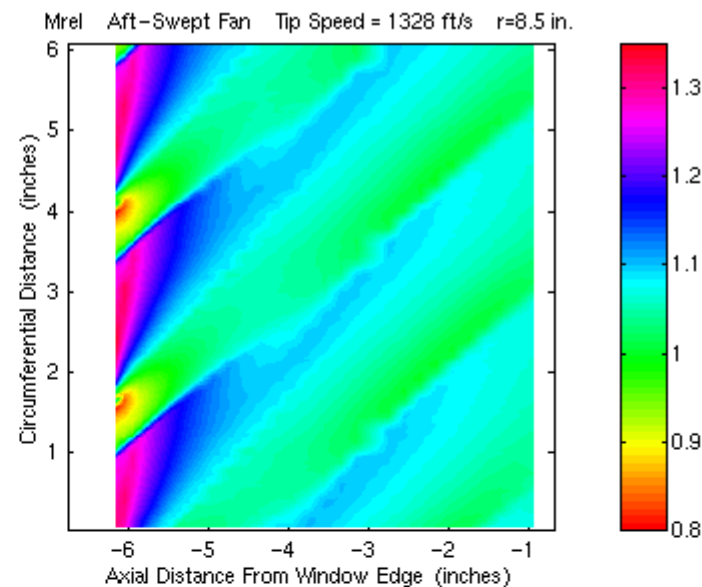
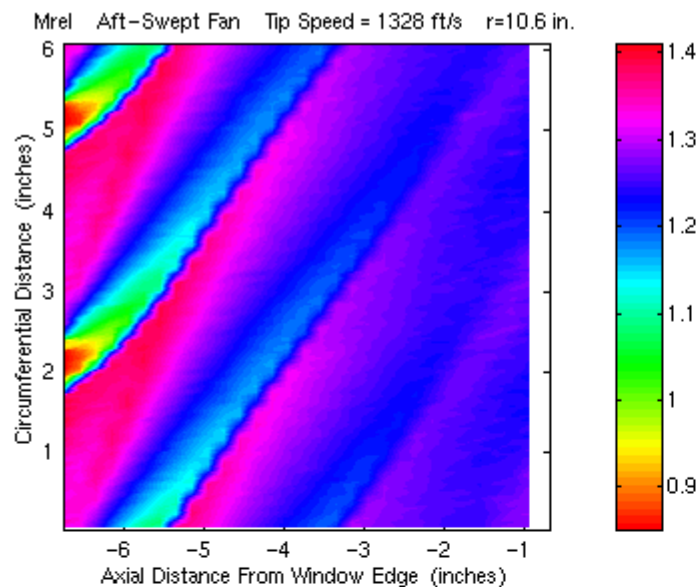


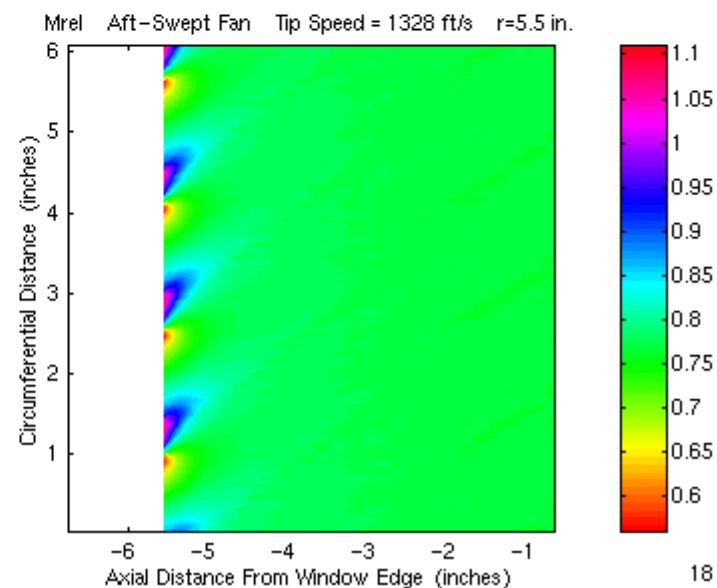
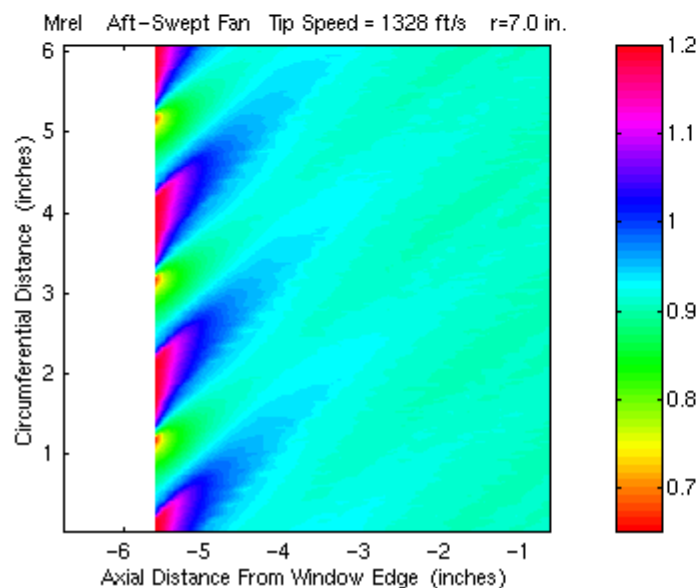
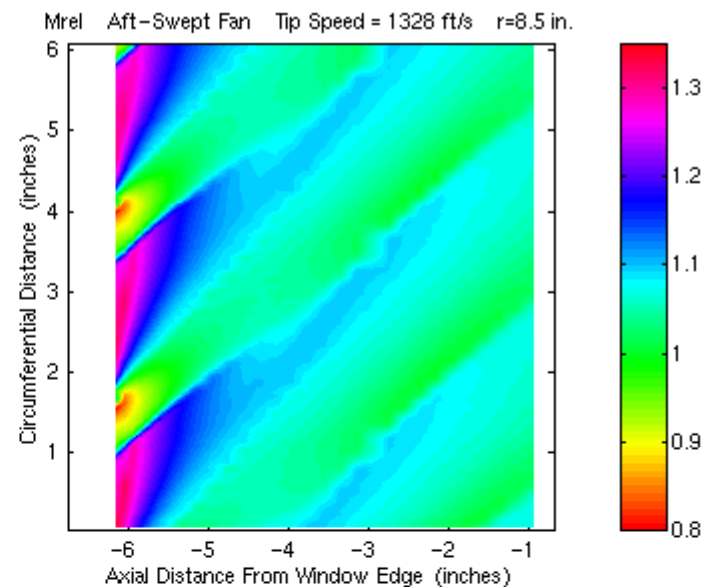
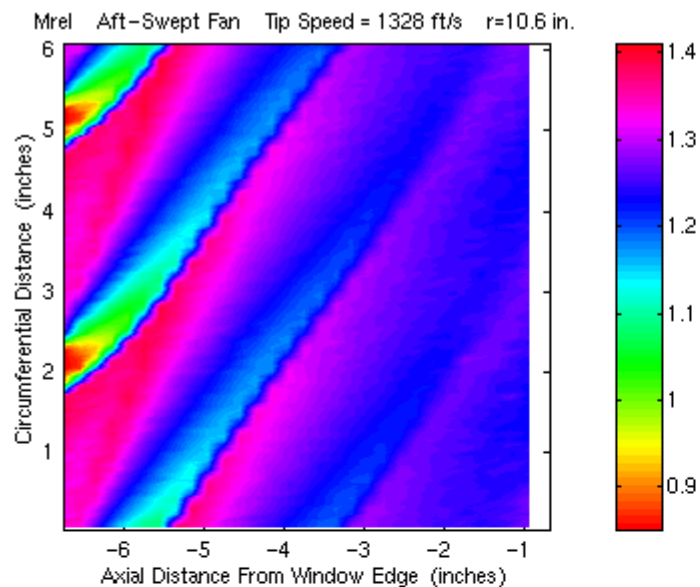


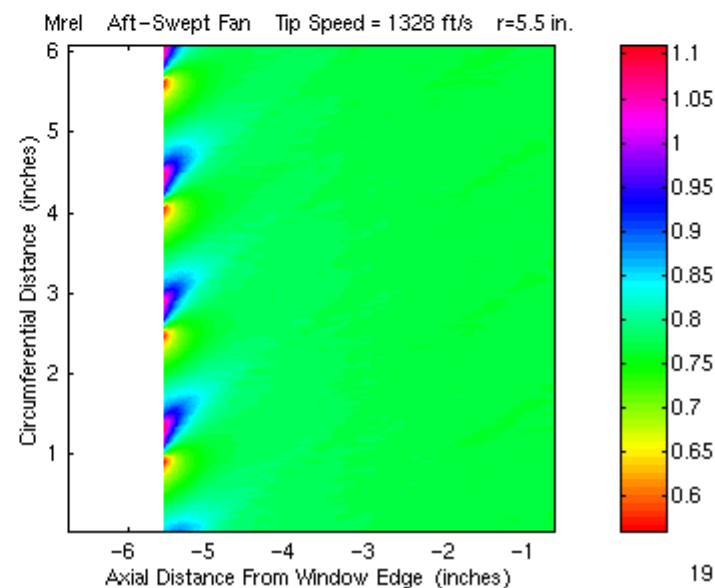
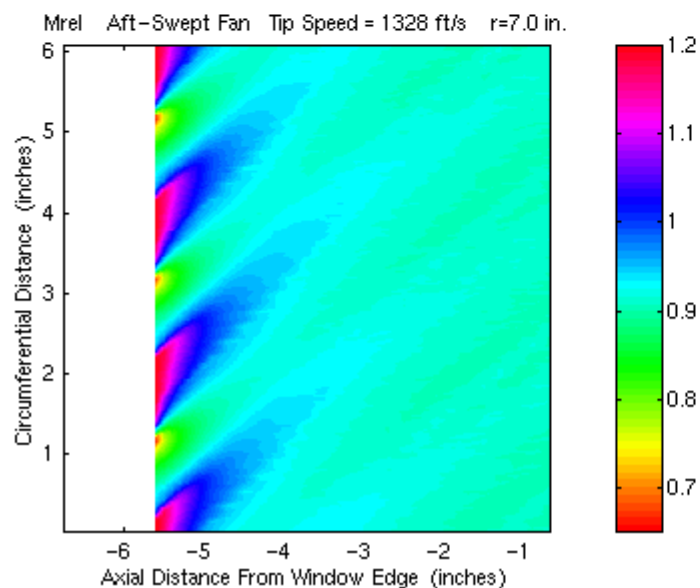
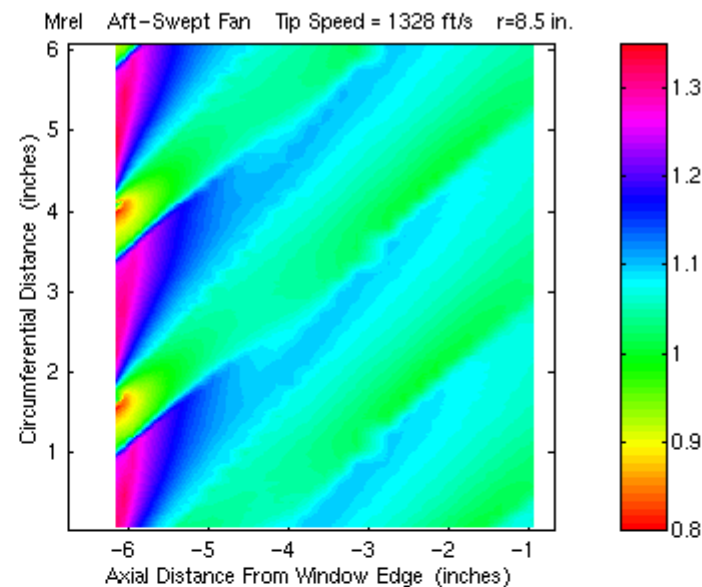
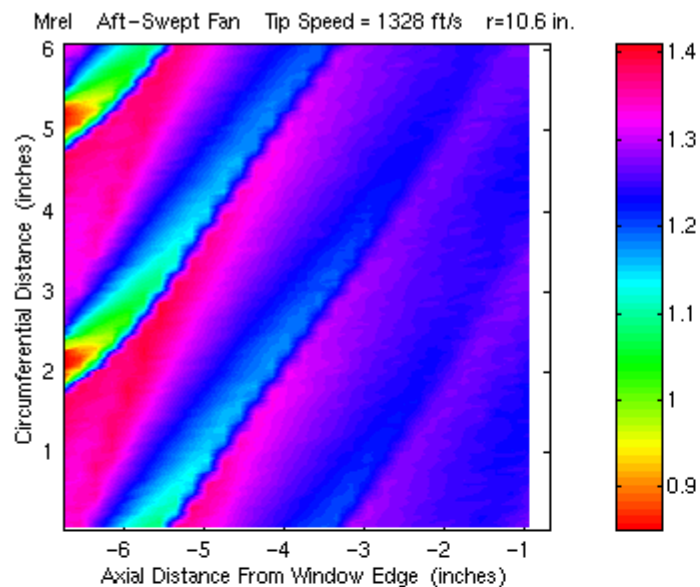


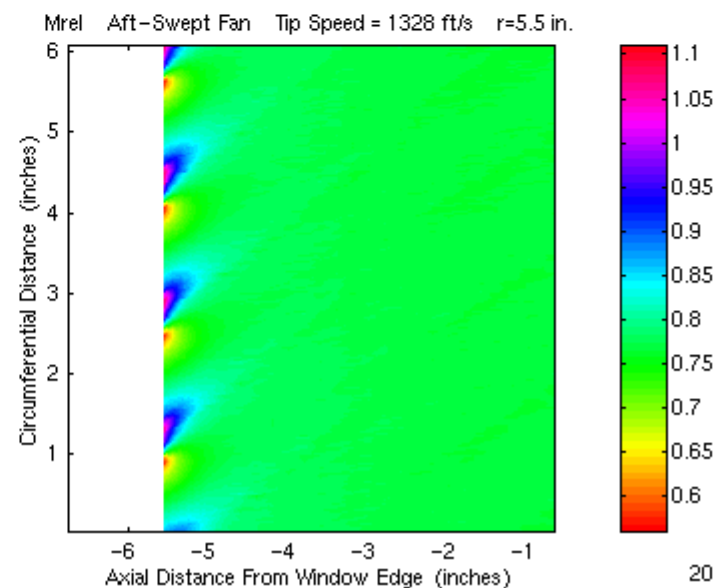
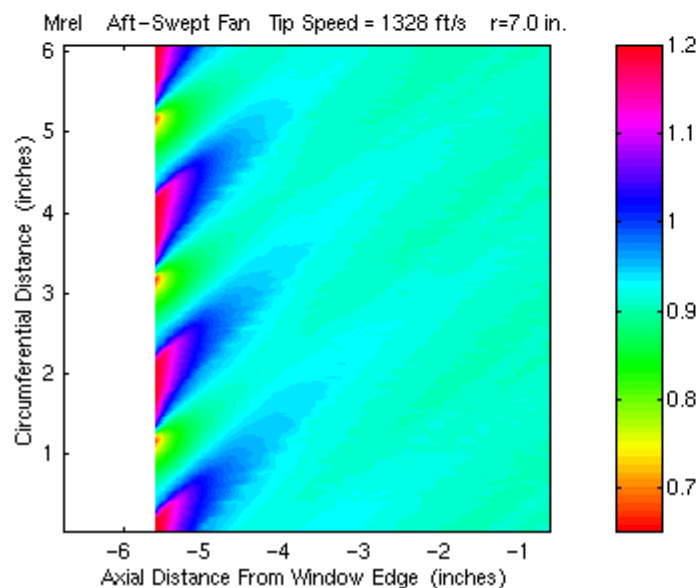
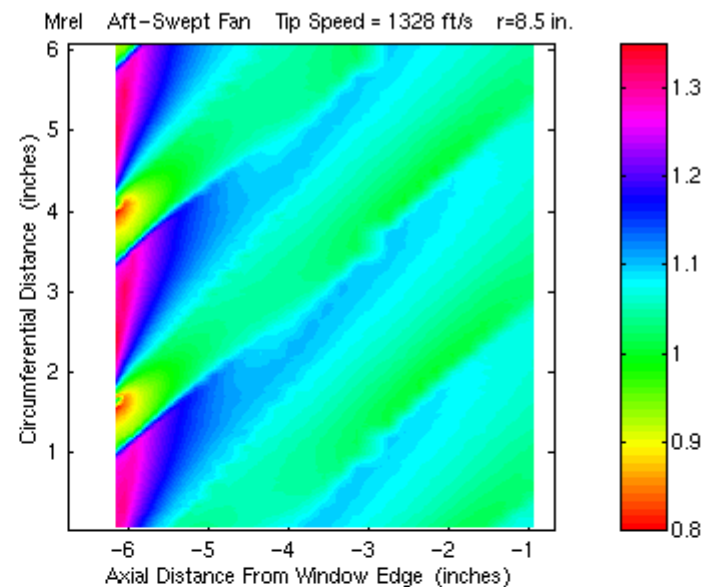
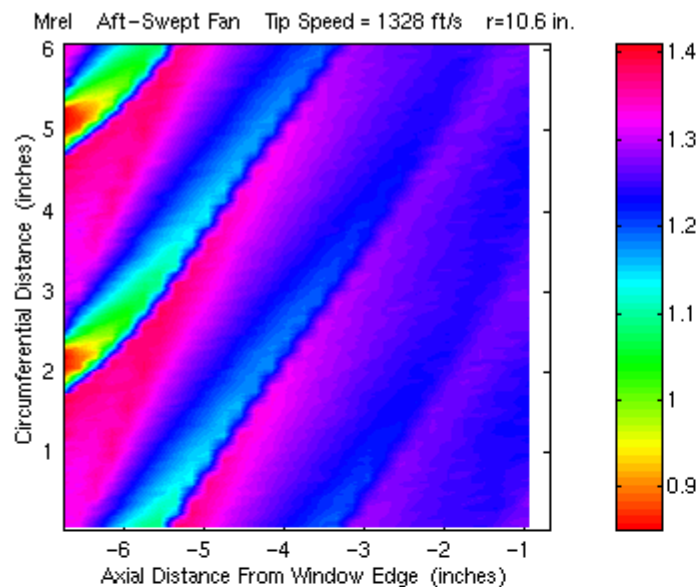


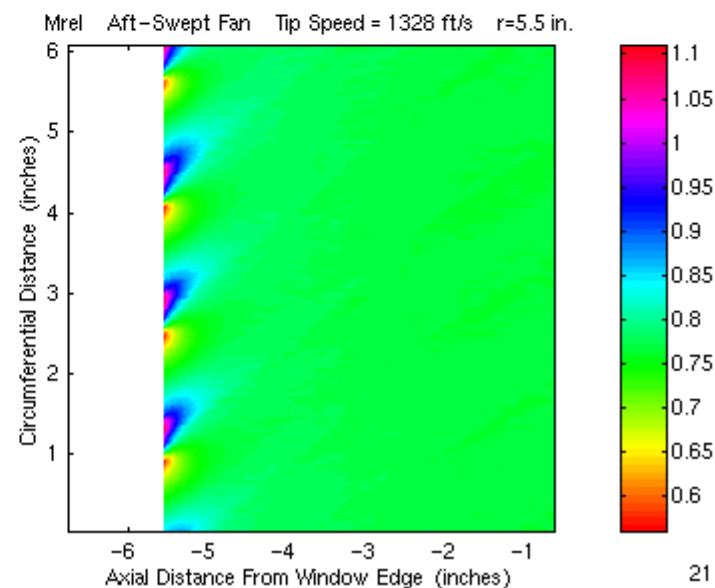
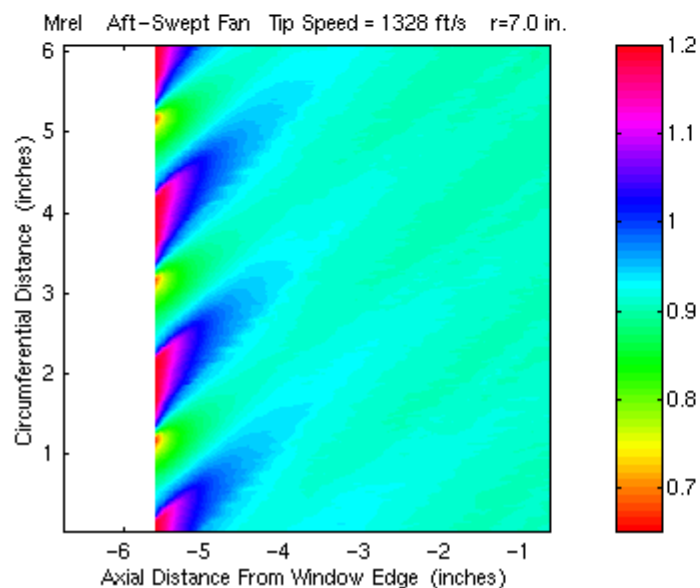
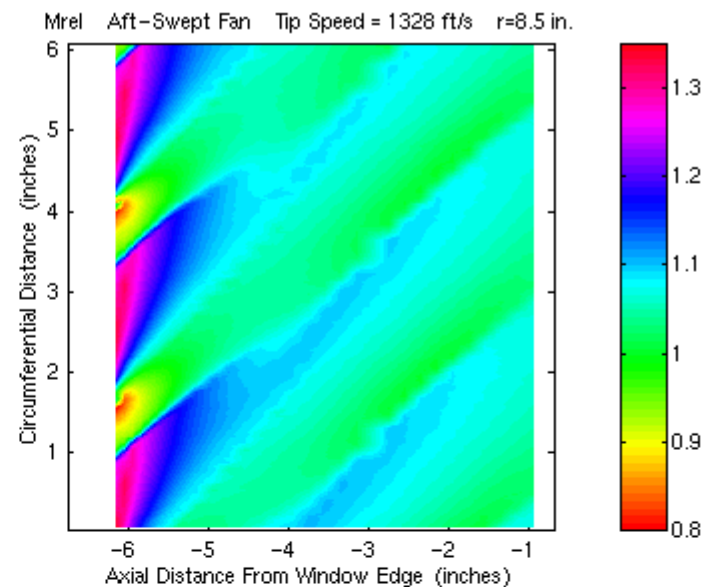
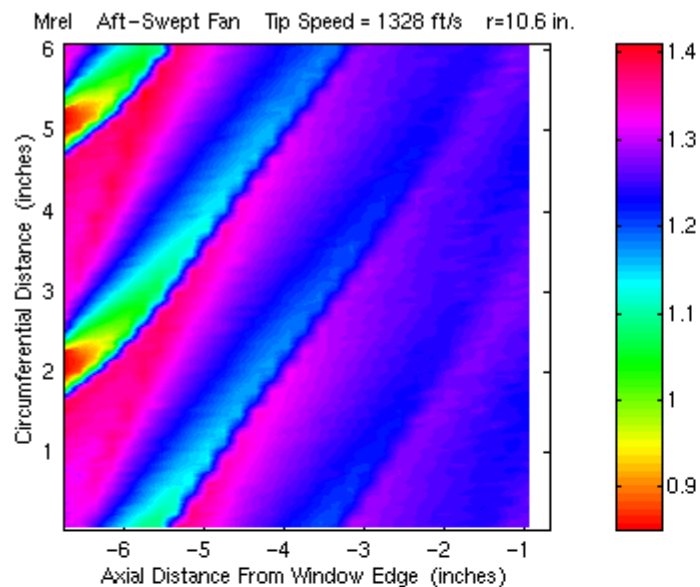












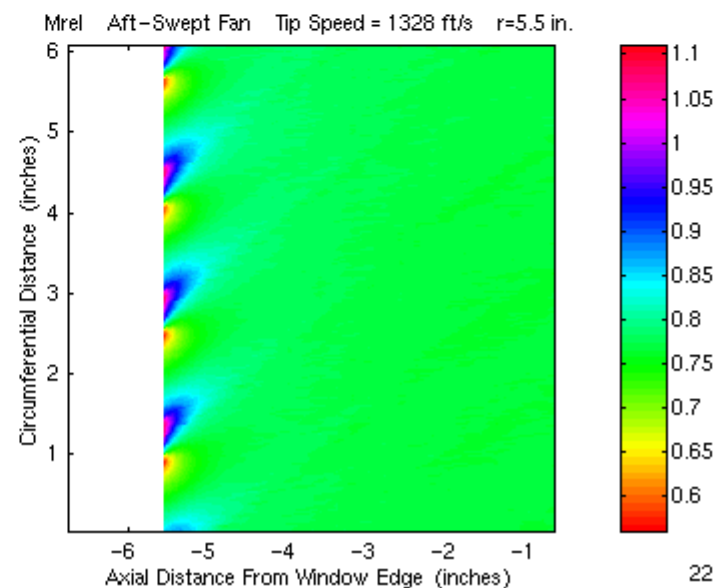
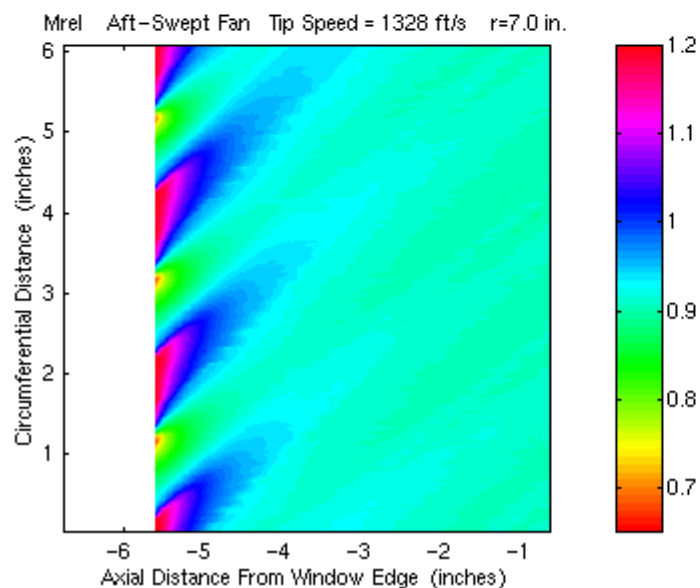
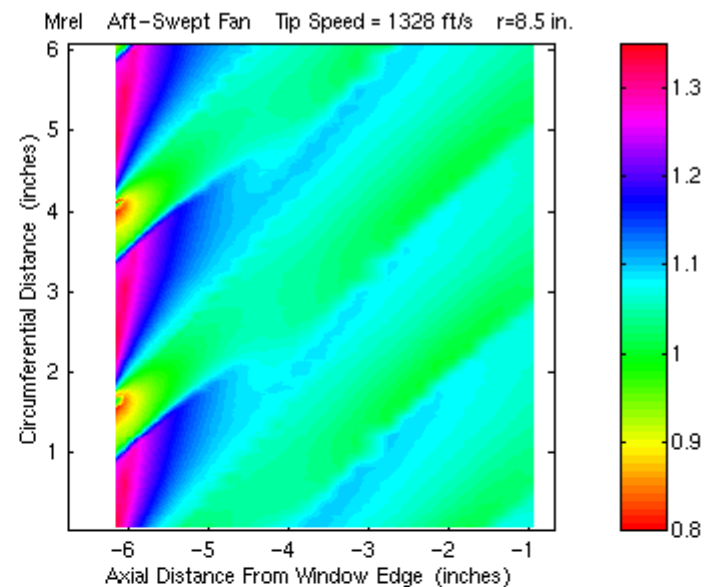
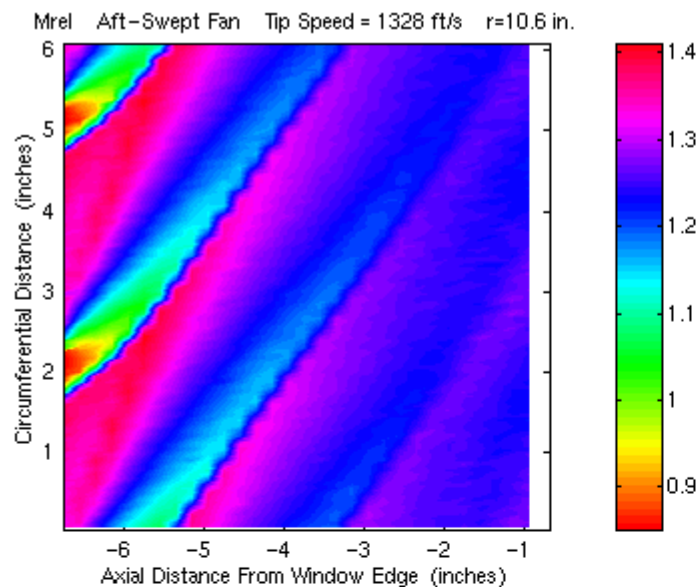
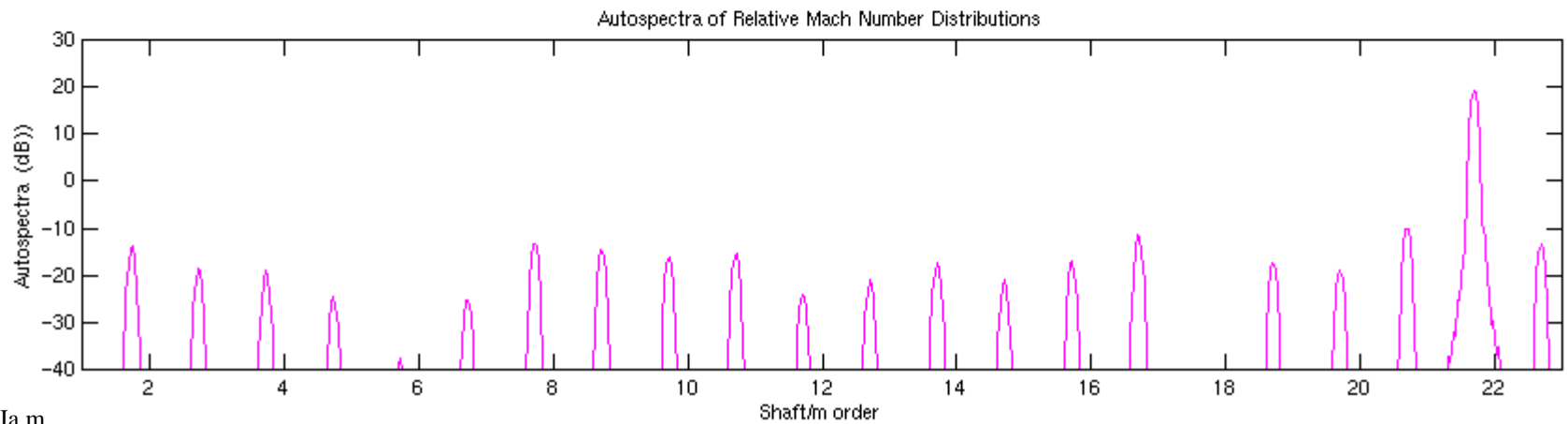
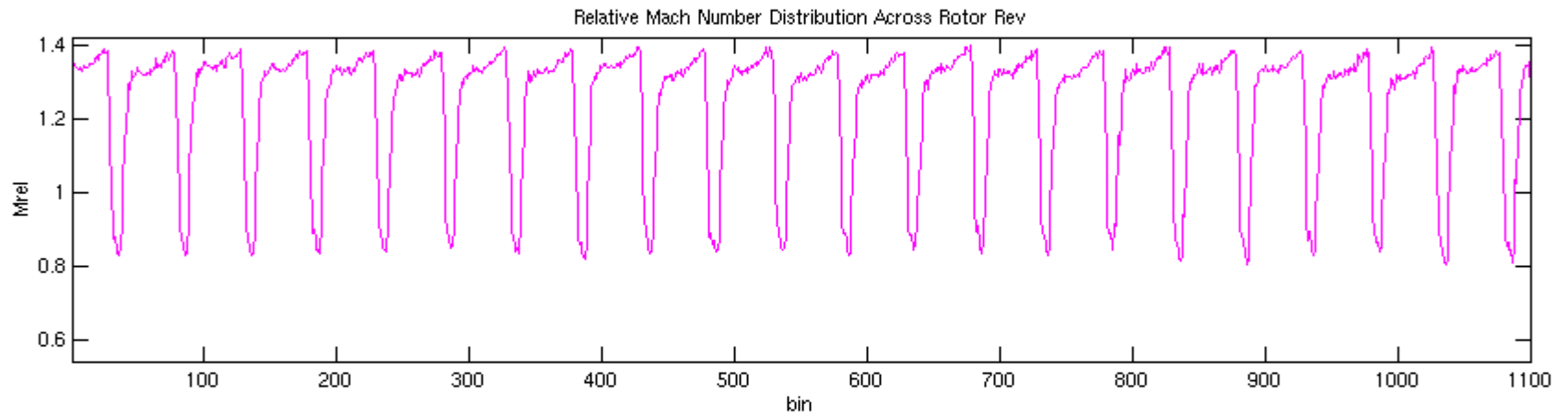
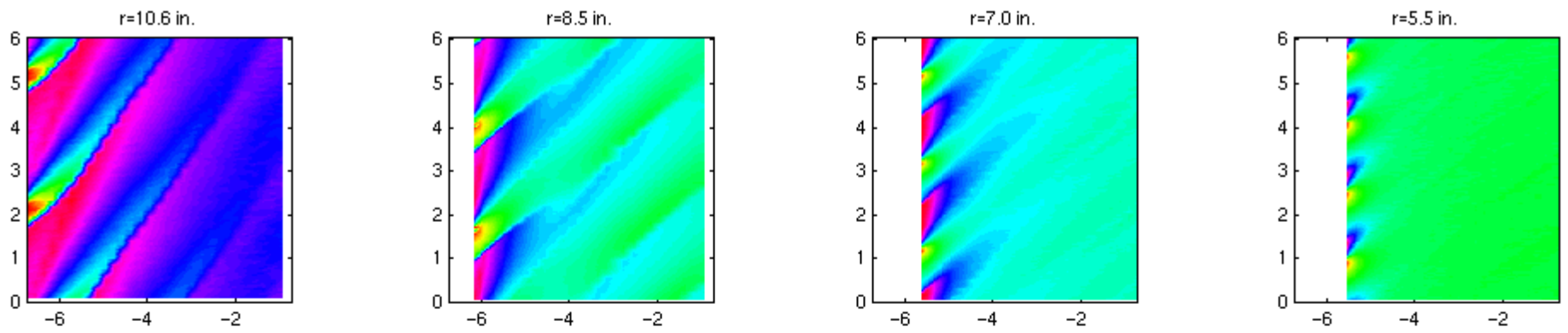
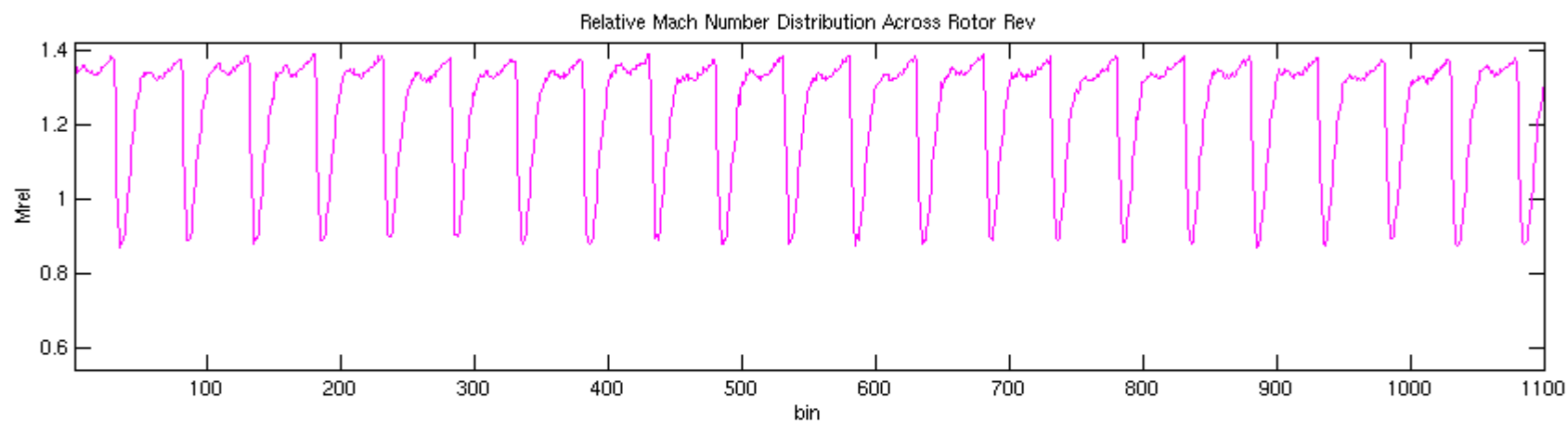
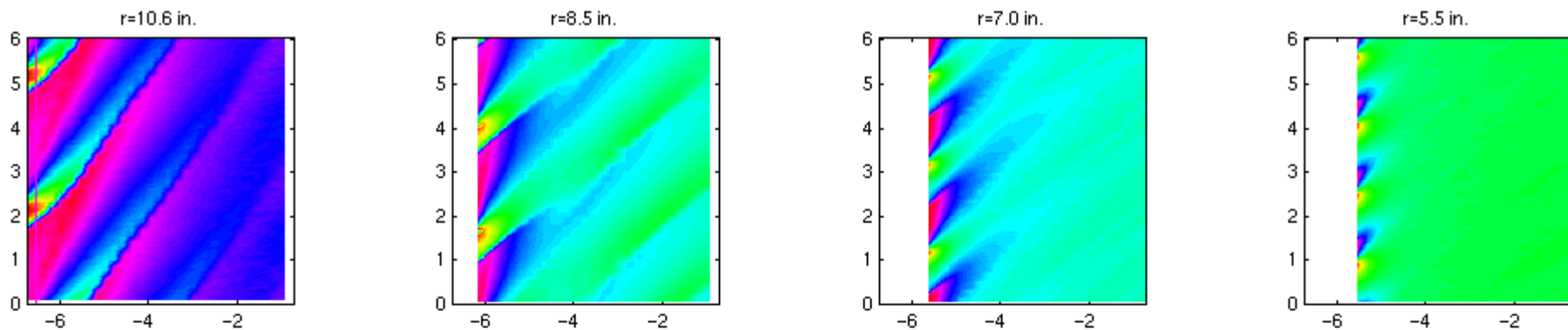
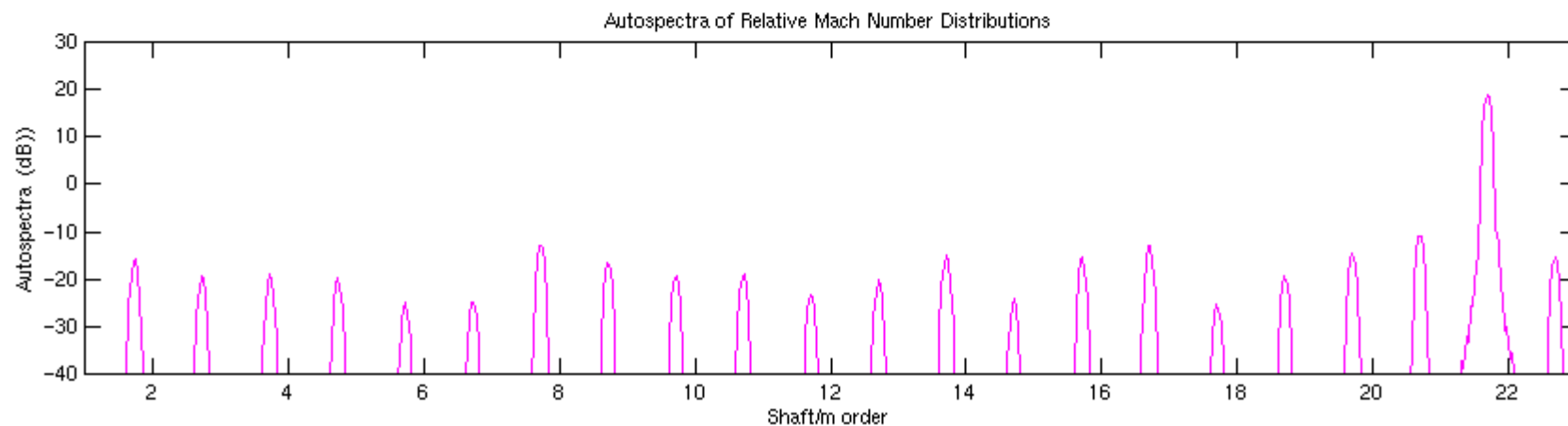


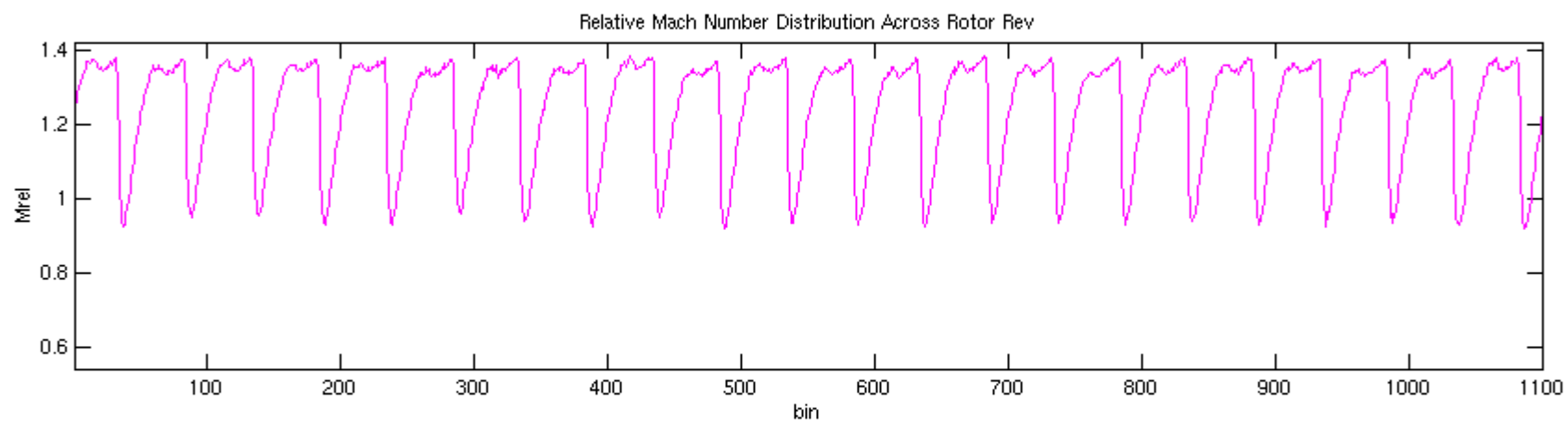
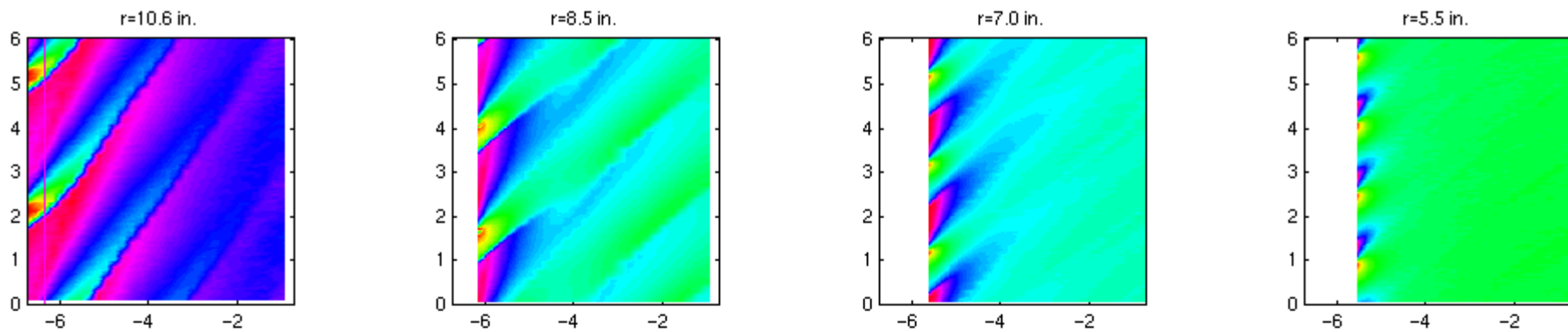
Figure 23.—Slideshow (29 slides) illustrating how the perturbation in the flow measured at four different radial locations upstream of the aft-swept fan varies with axial location at the high-speed condition. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows autospectra computed from the relative Mach number distributions ($m = 22$ corresponds to the blade passing frequency). The solid lines overlaid on top of the color contour plots show the axial locations at which the data presented on that slide were acquired



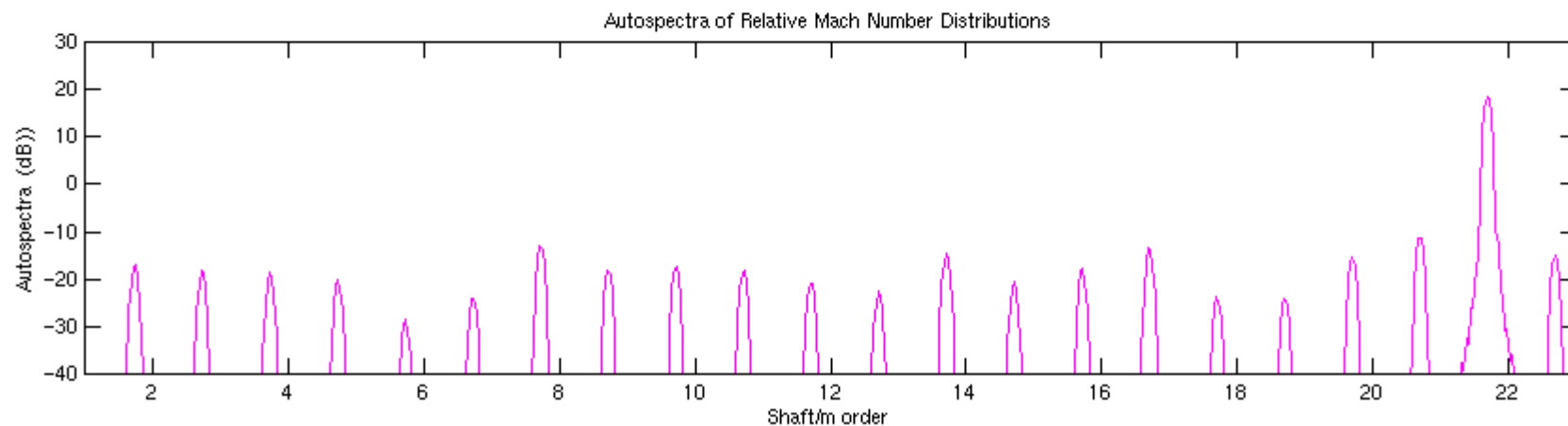


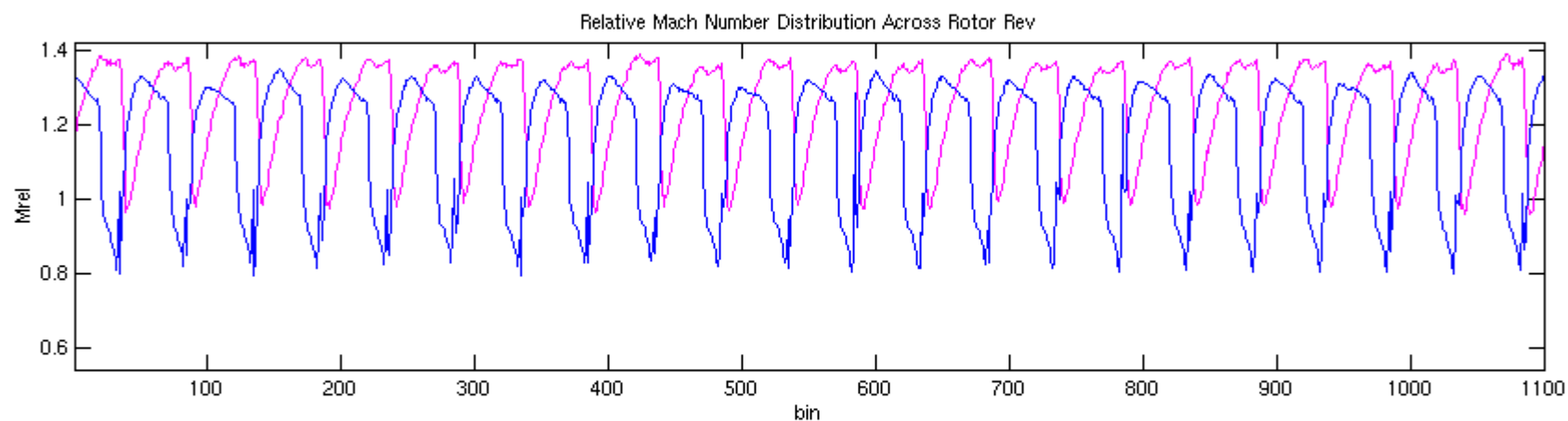
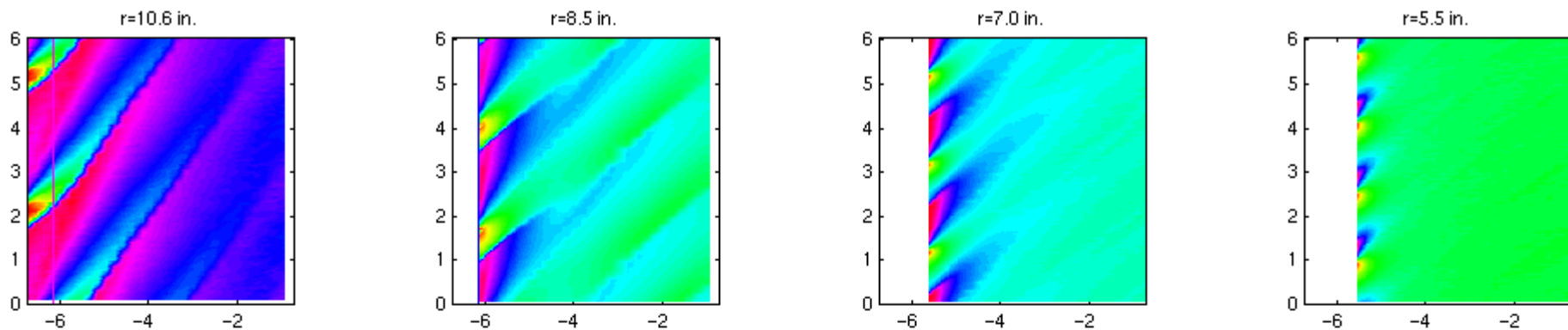
2



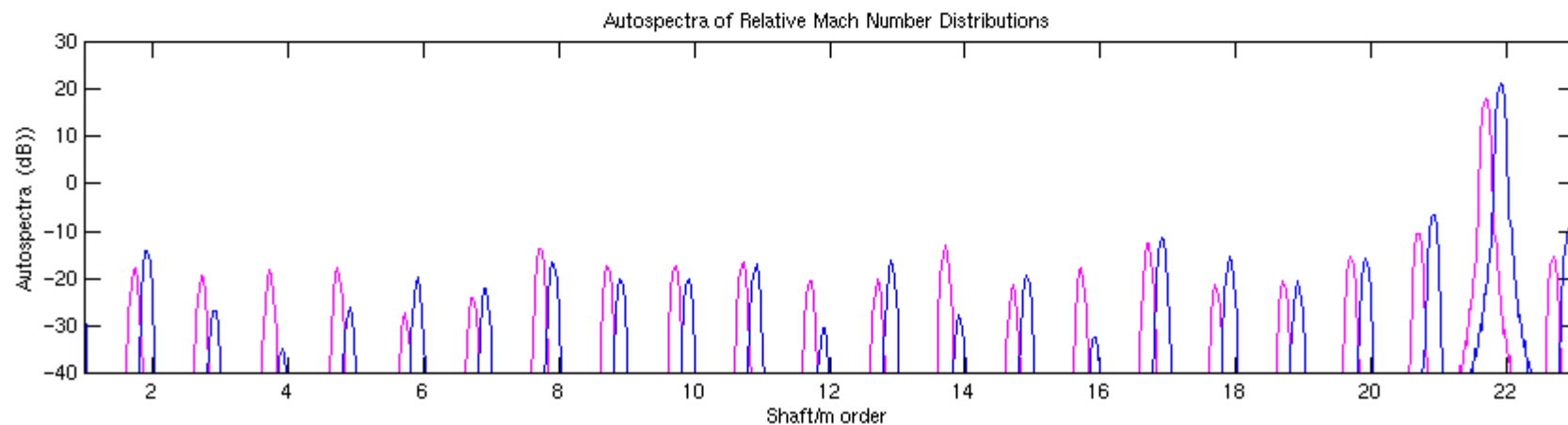


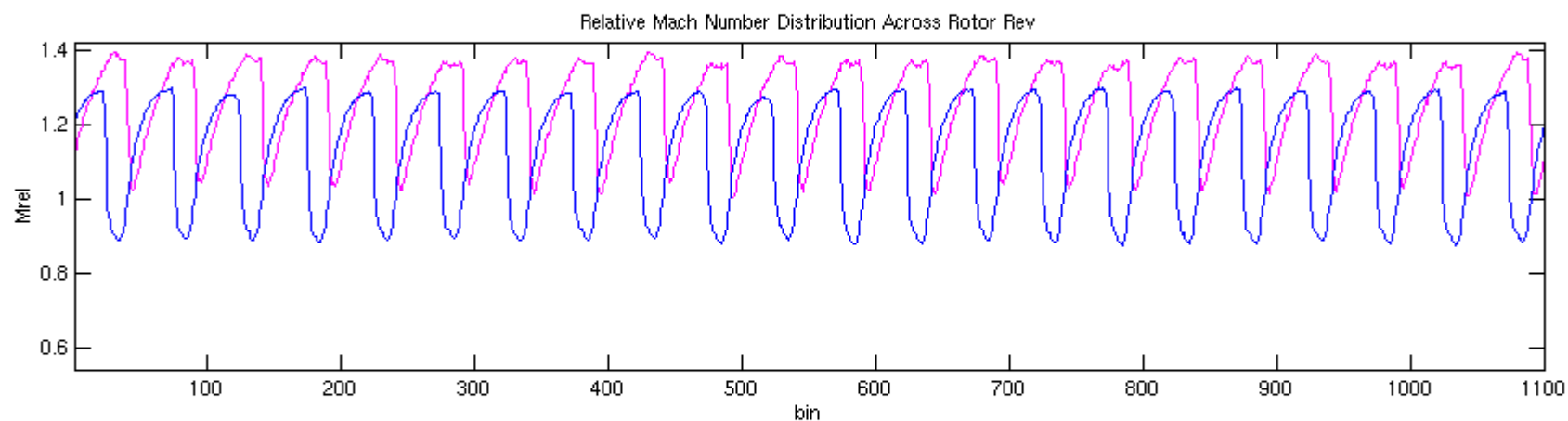
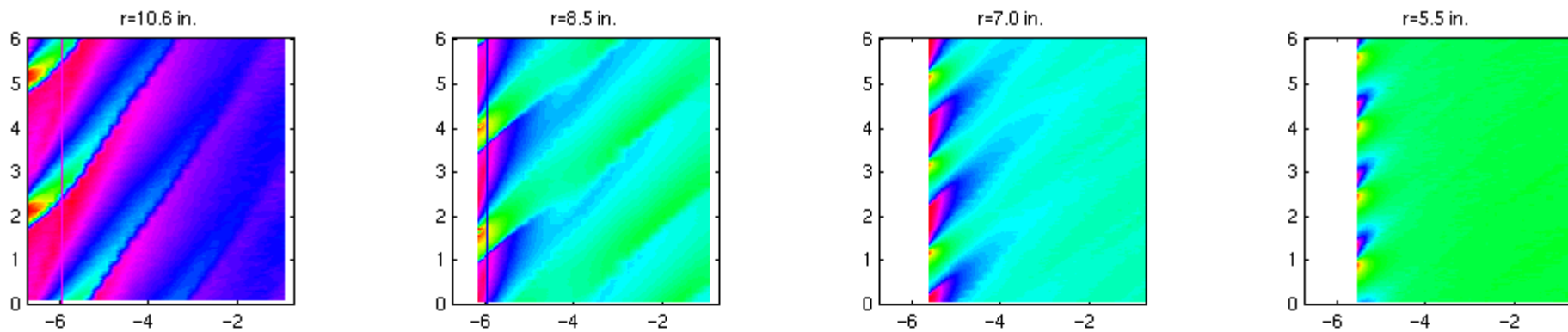
3



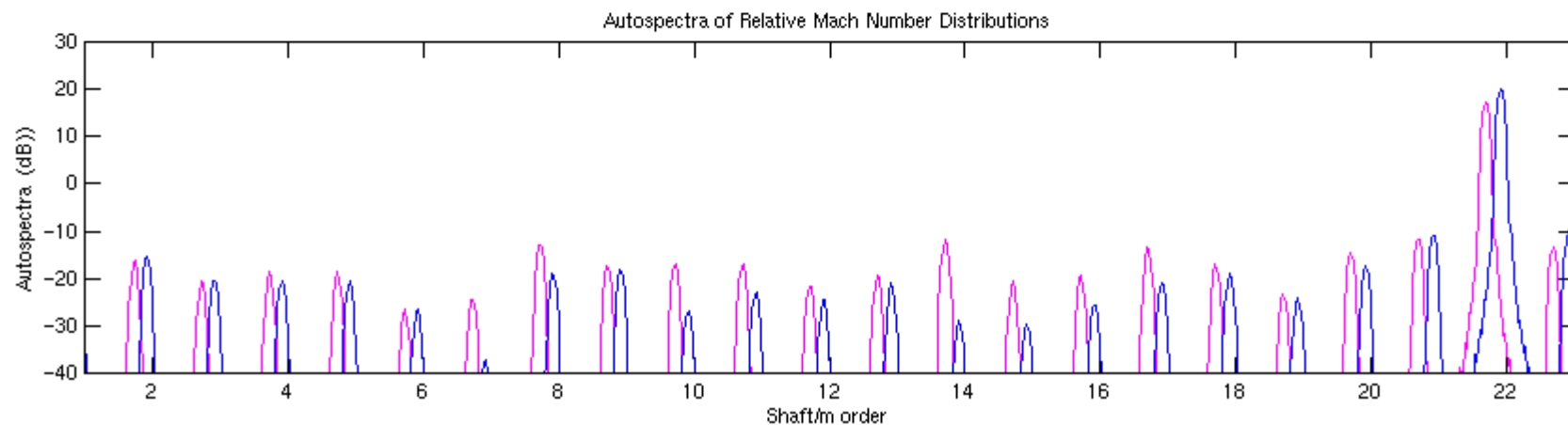


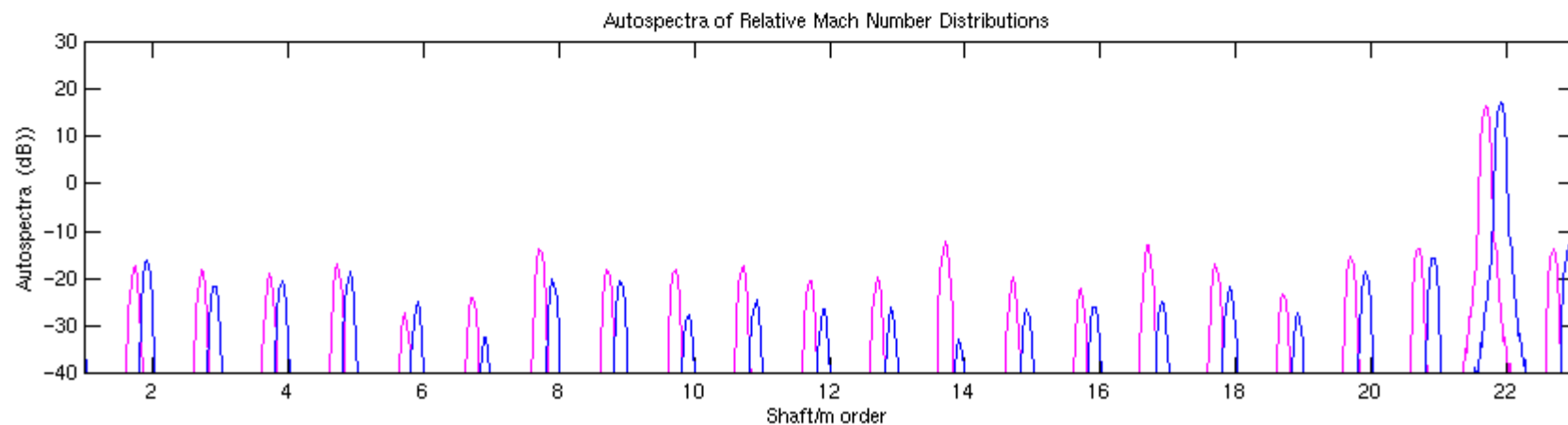
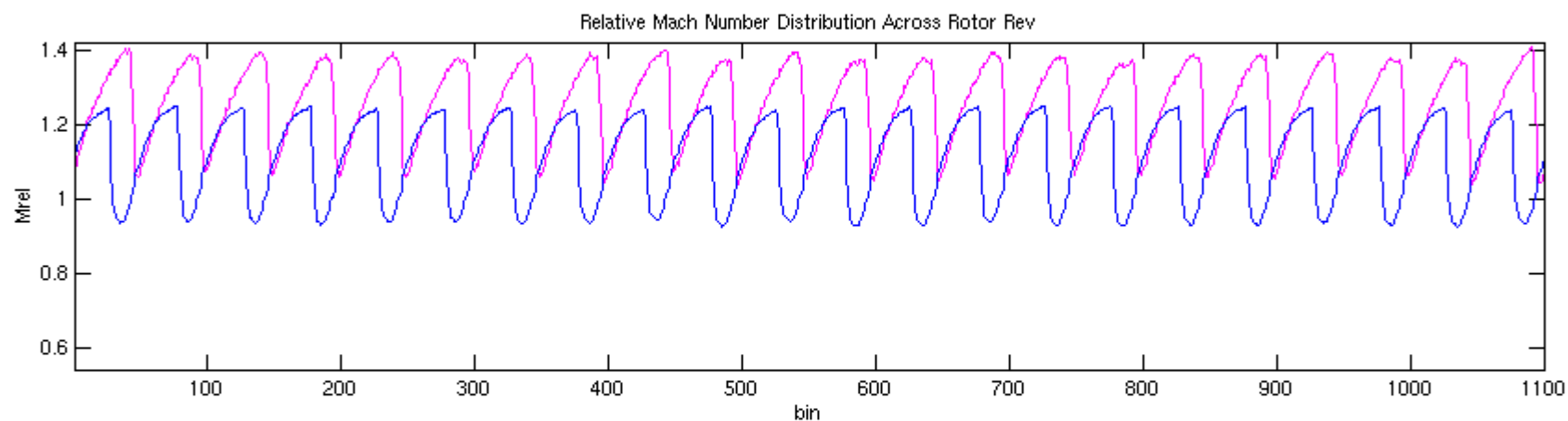
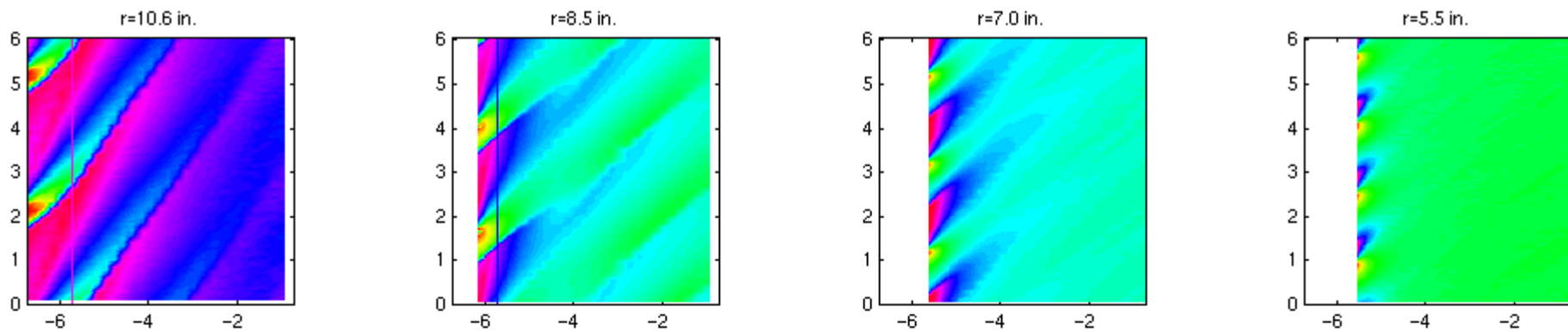
4

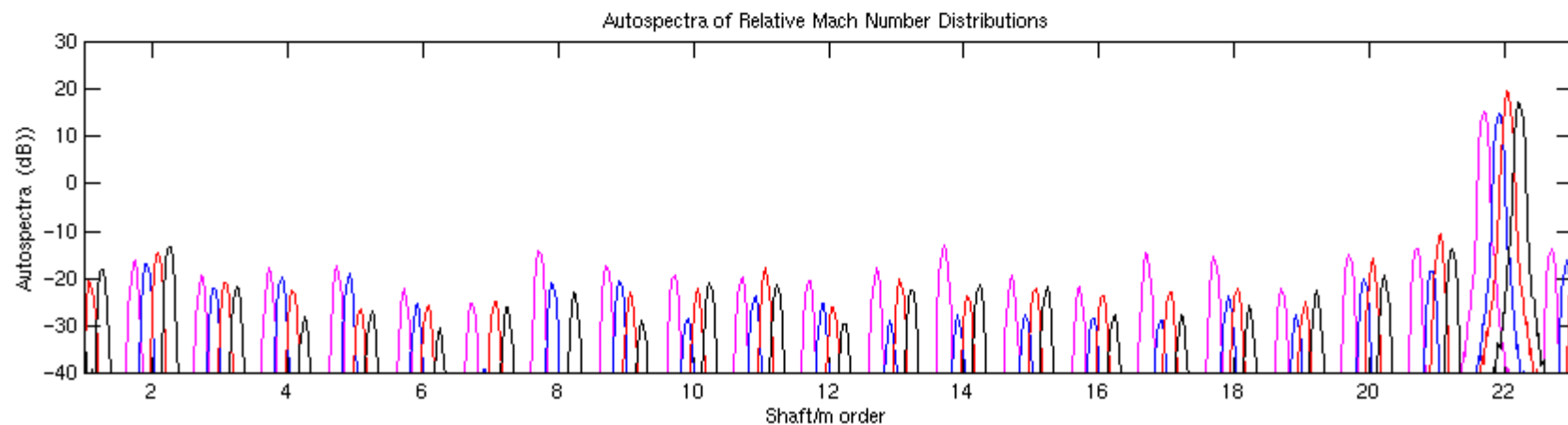
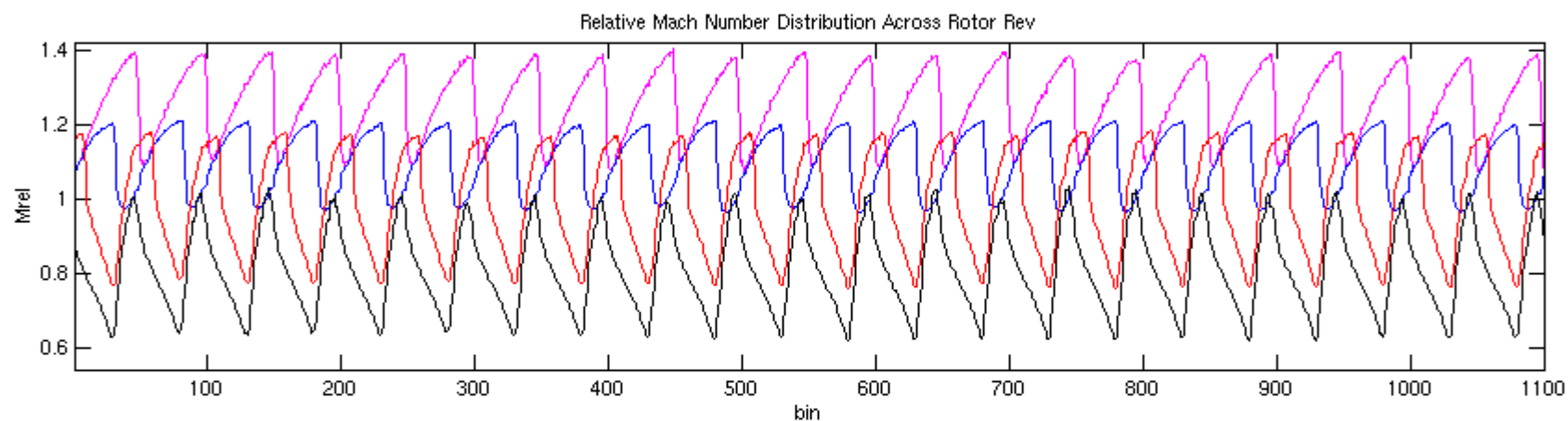
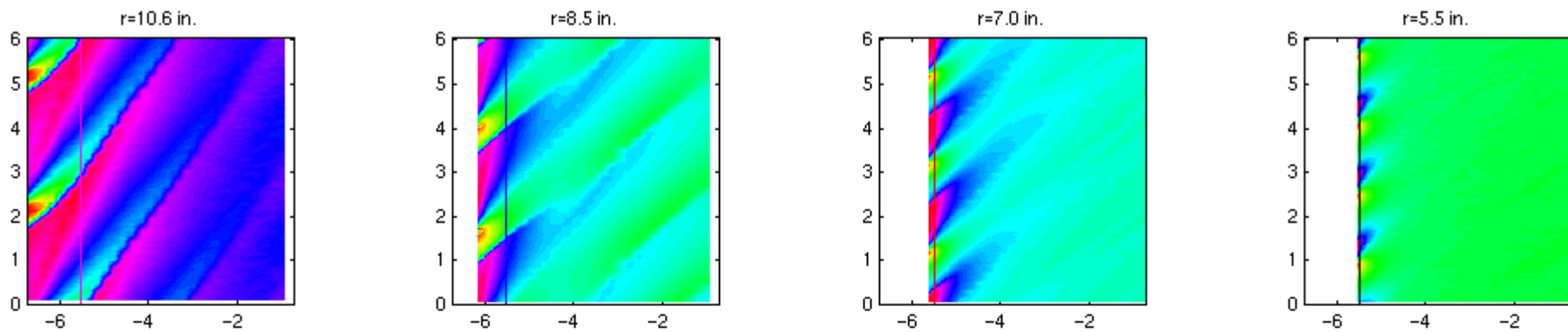


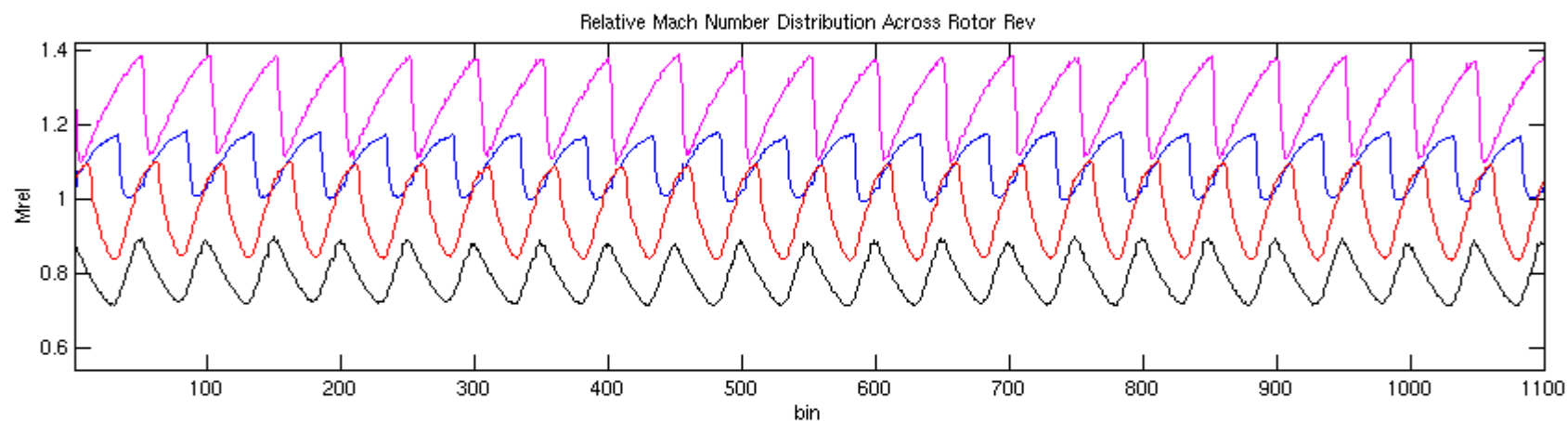
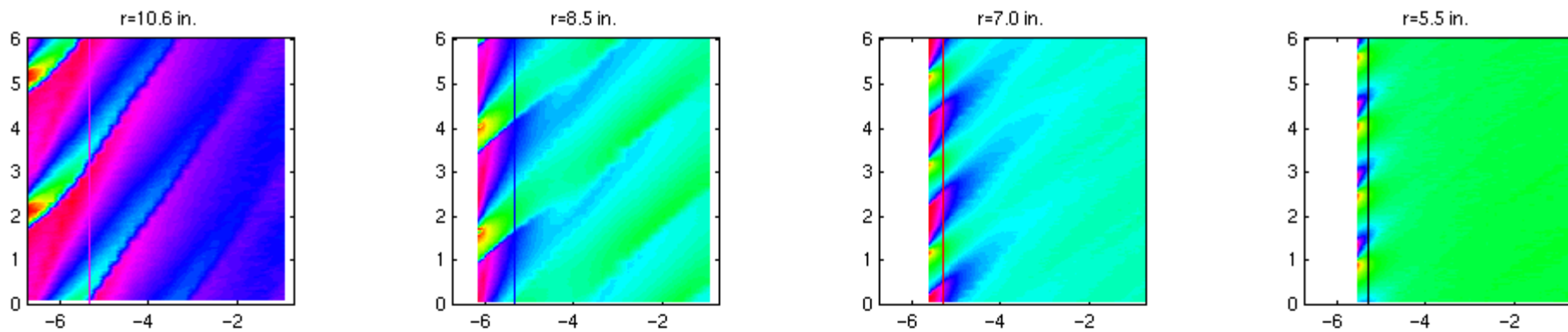


5

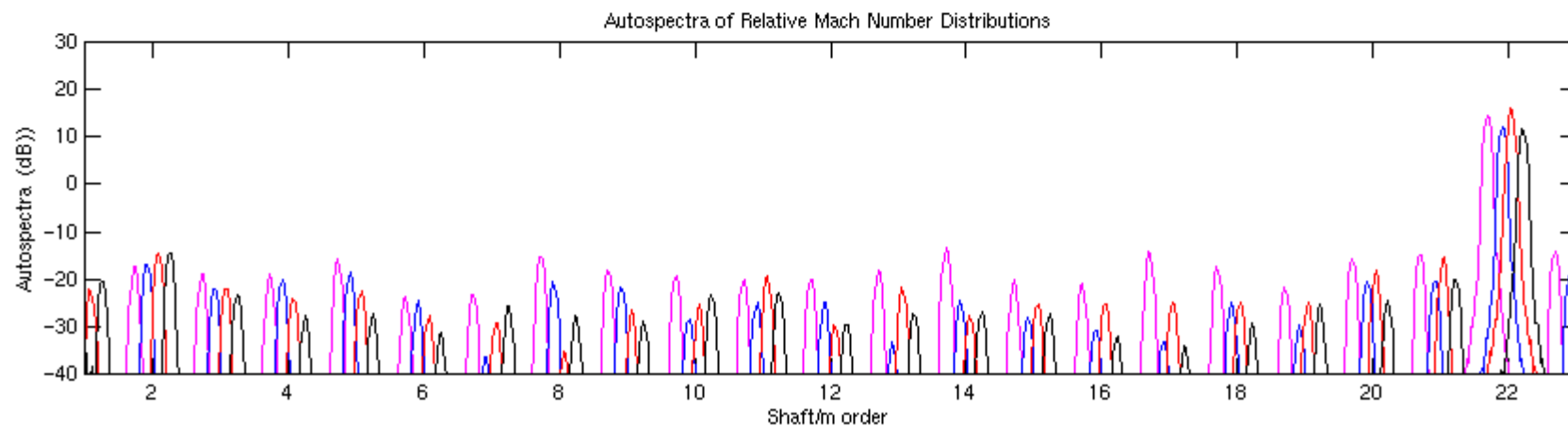


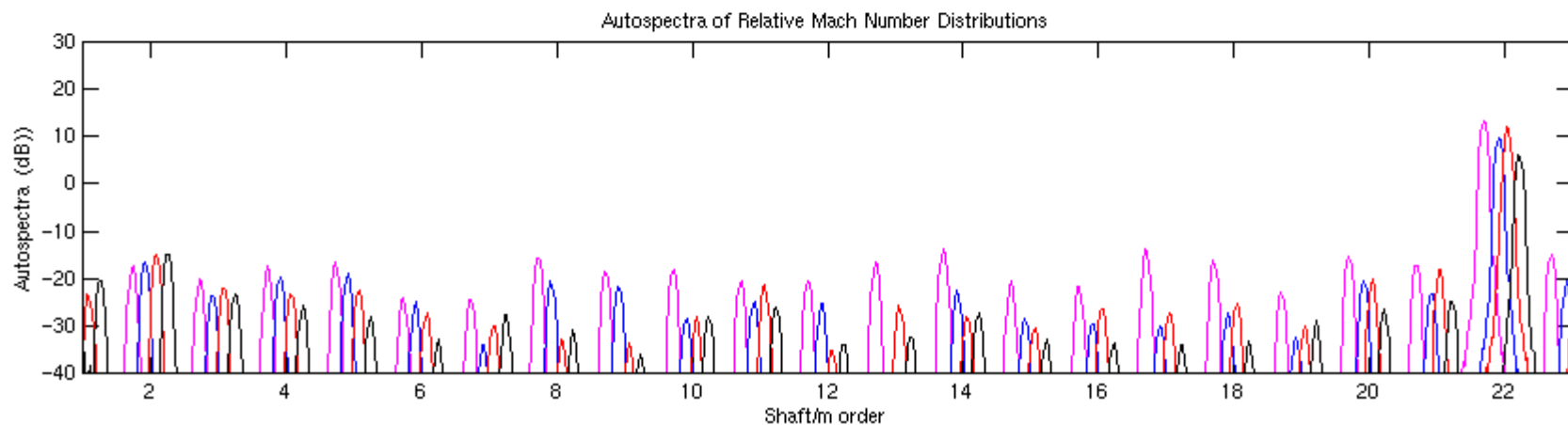
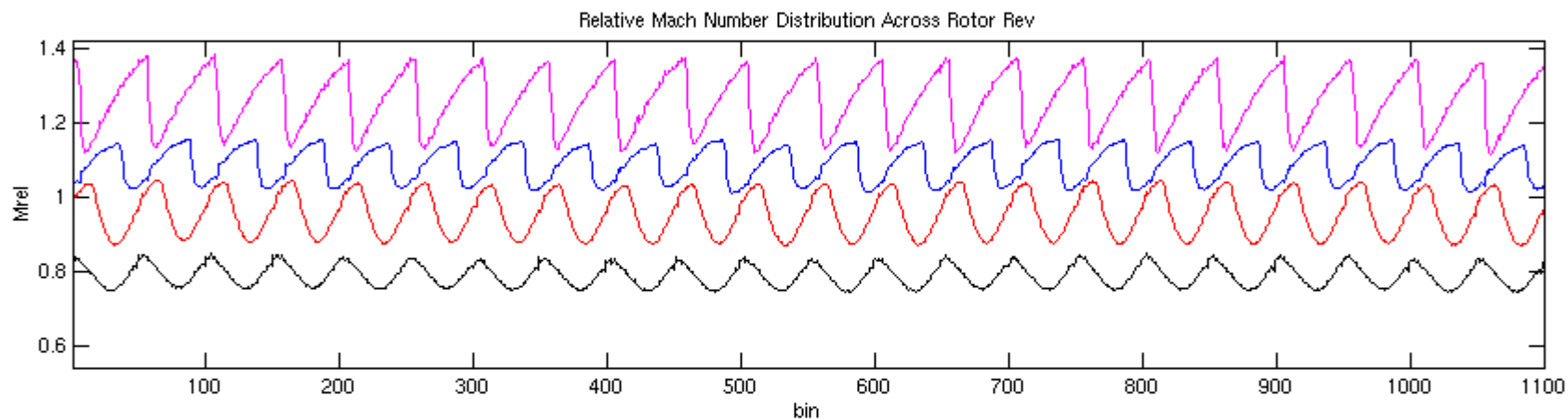
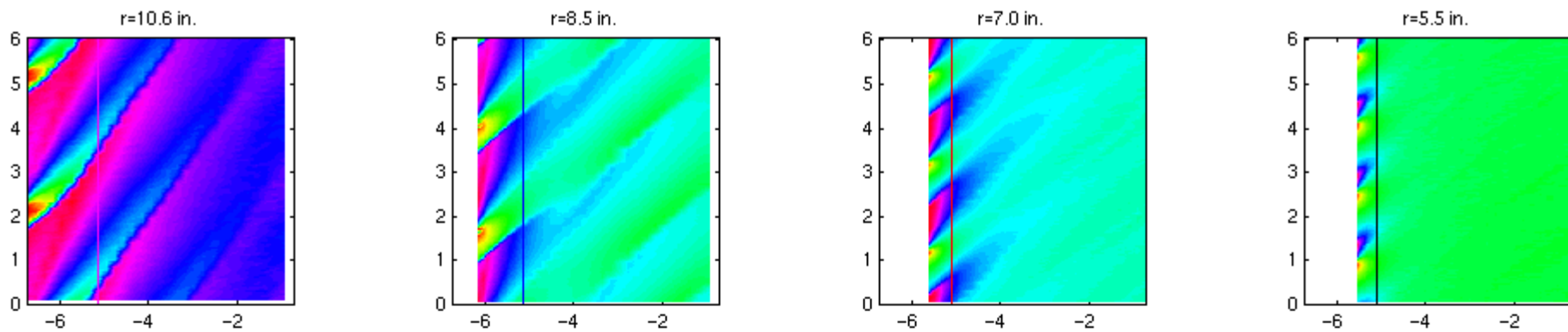


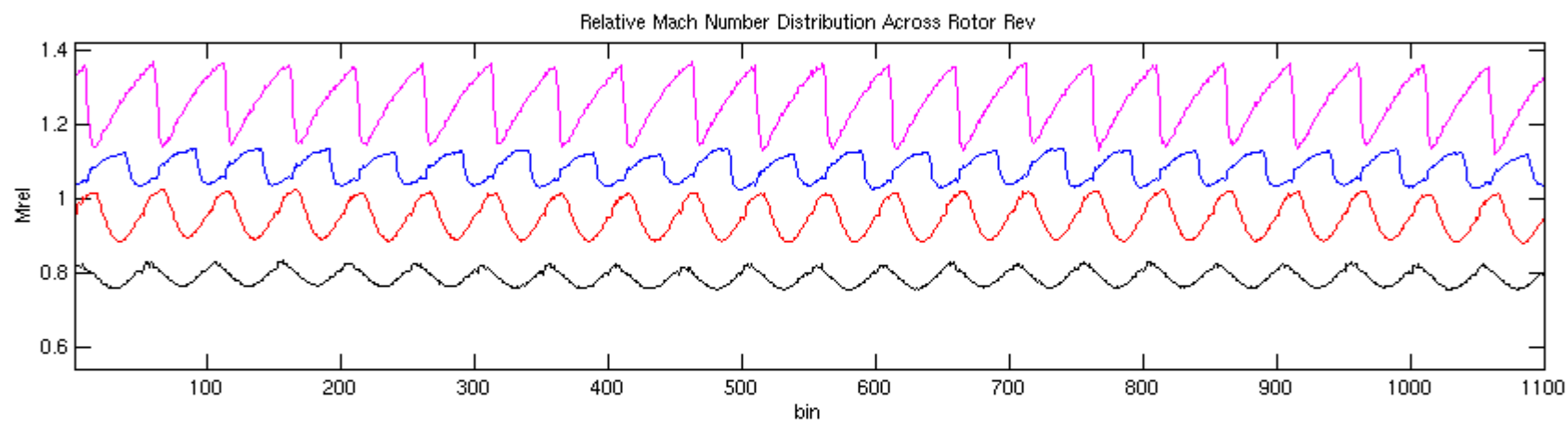
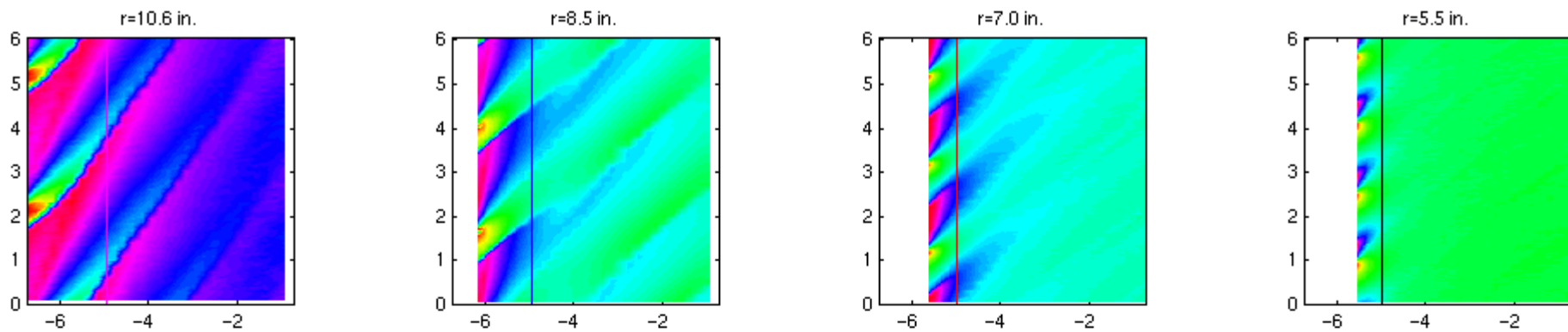




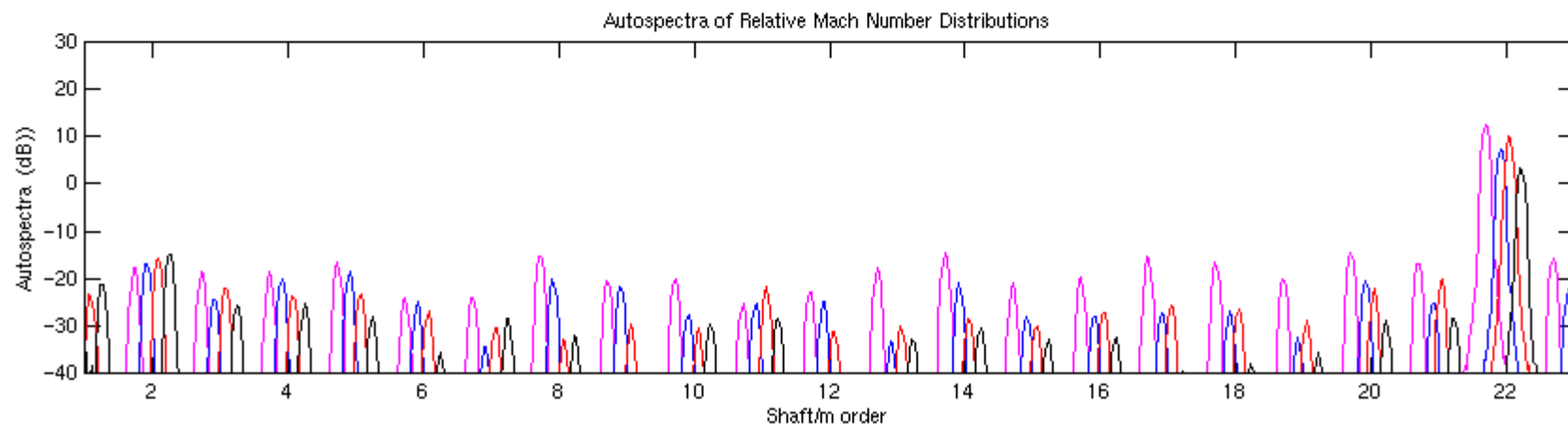
8

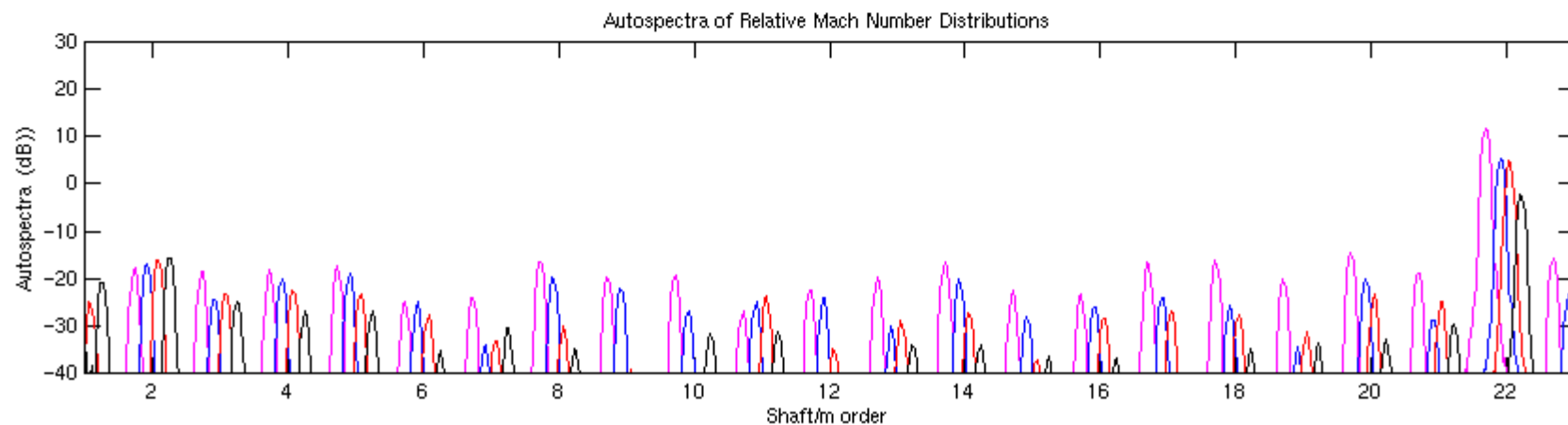
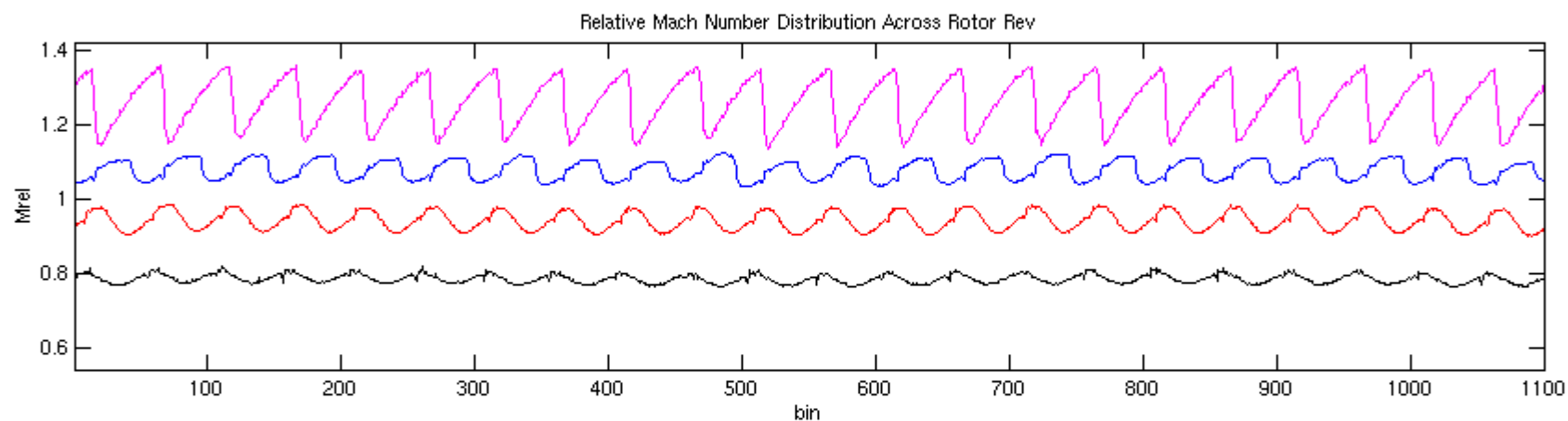
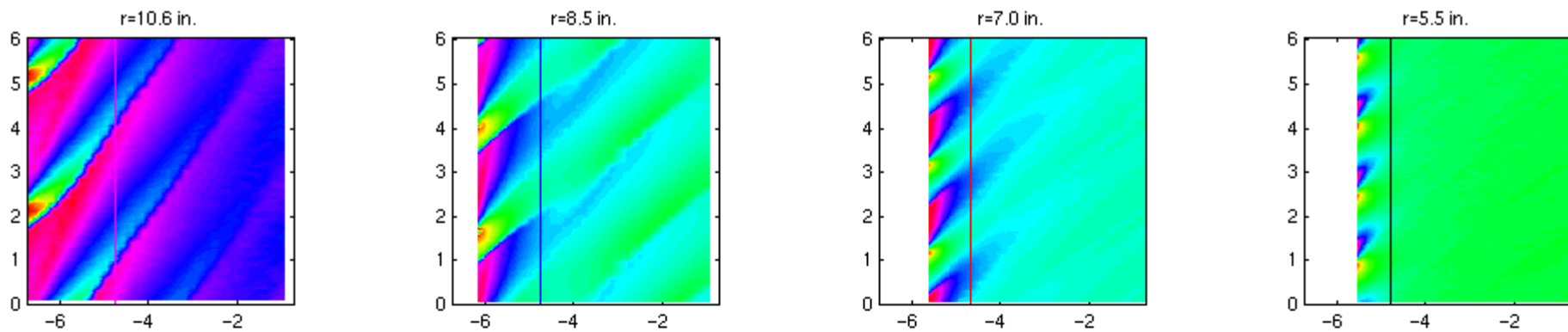


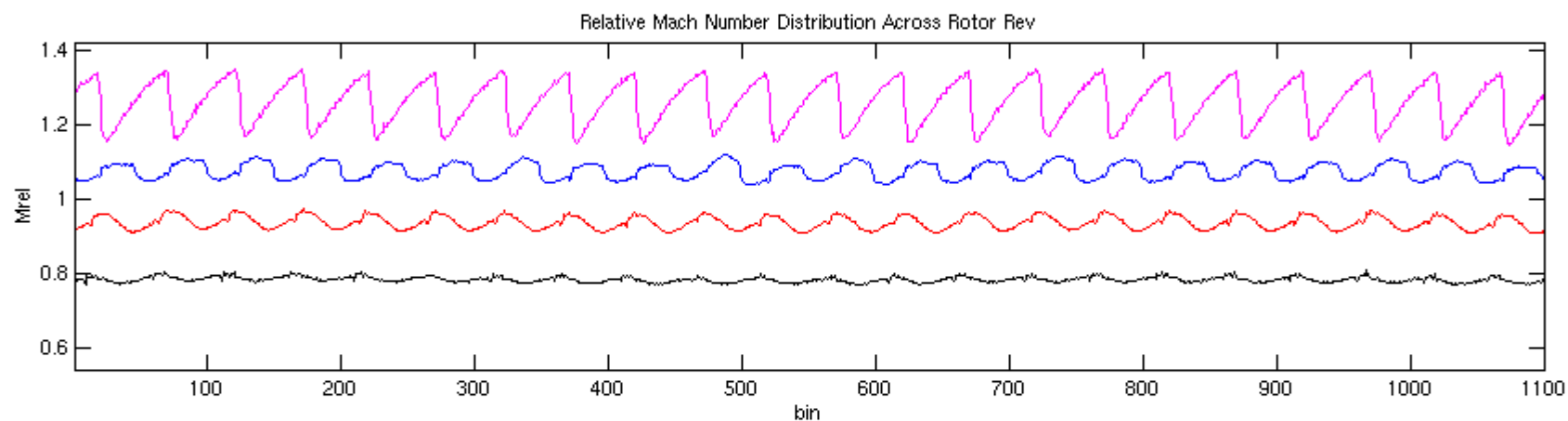
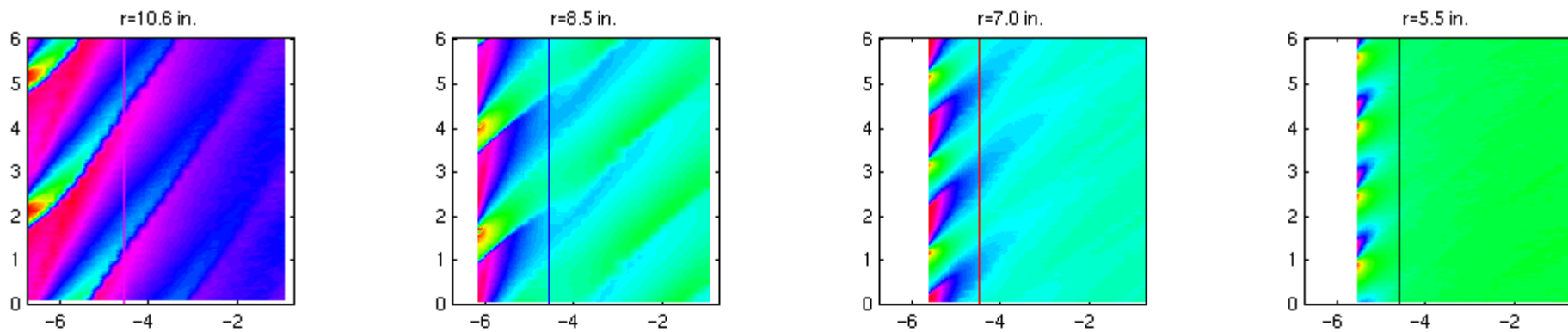




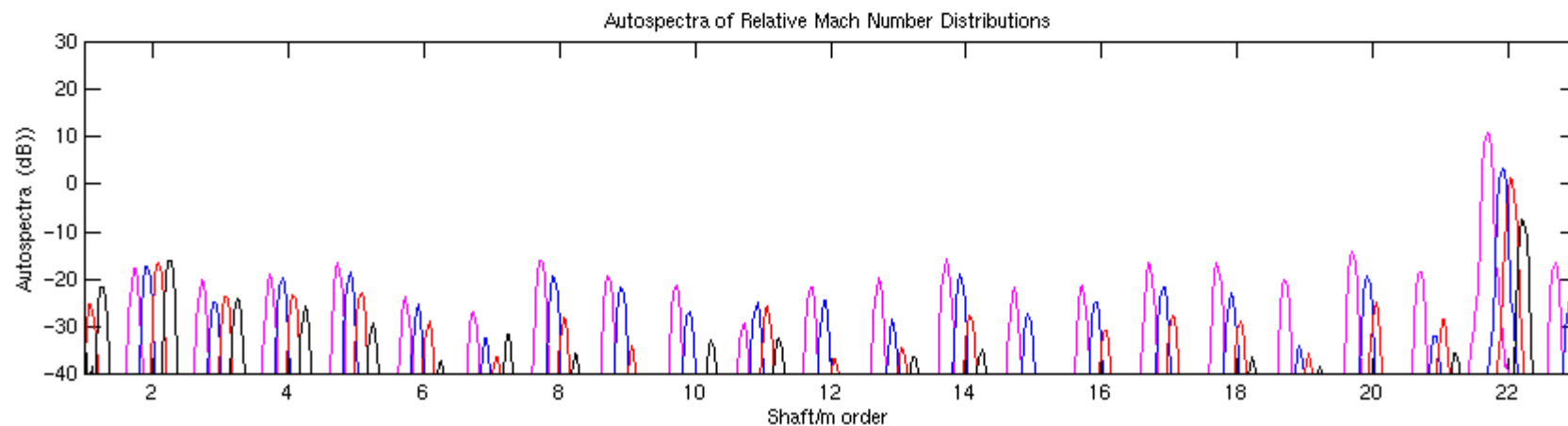
10

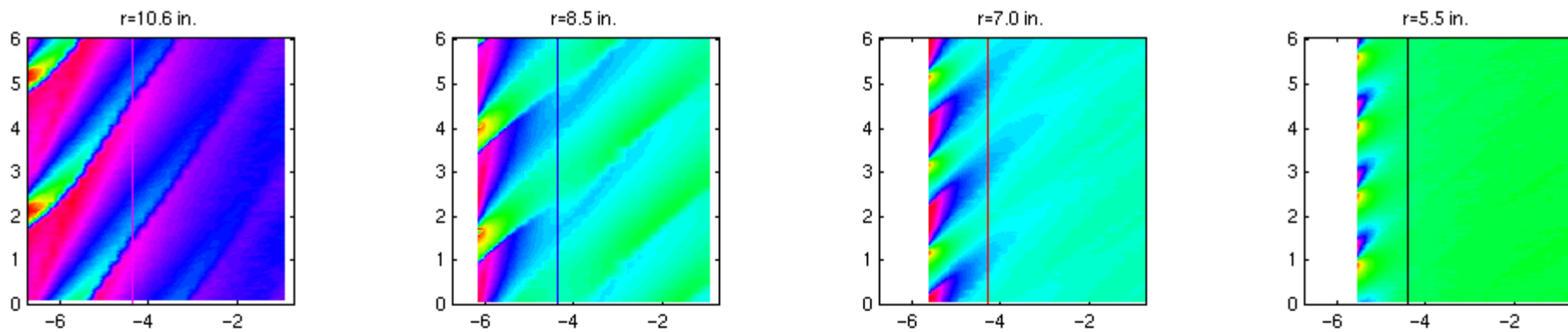




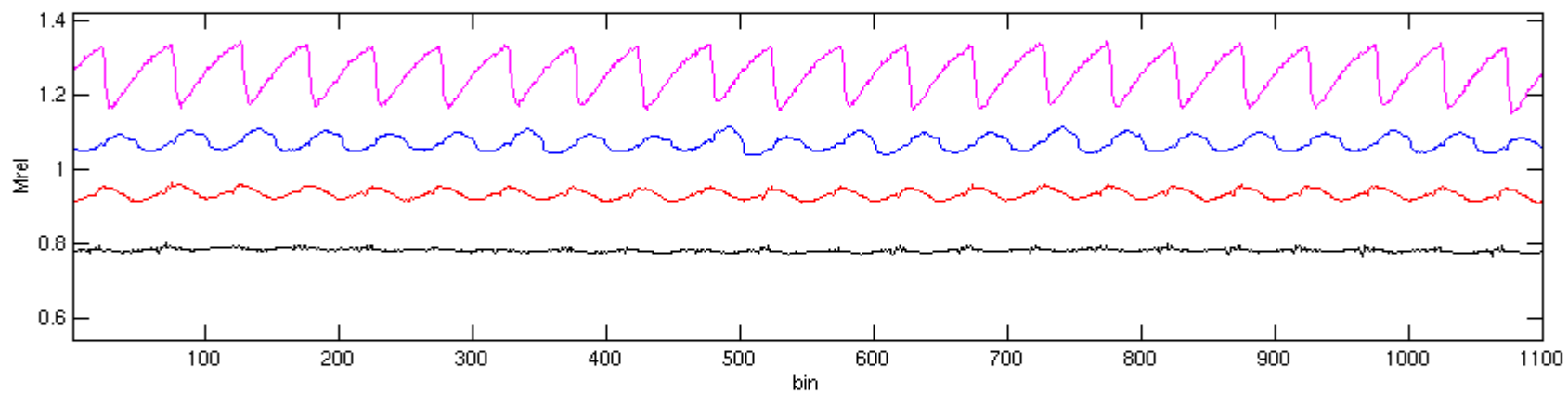


12



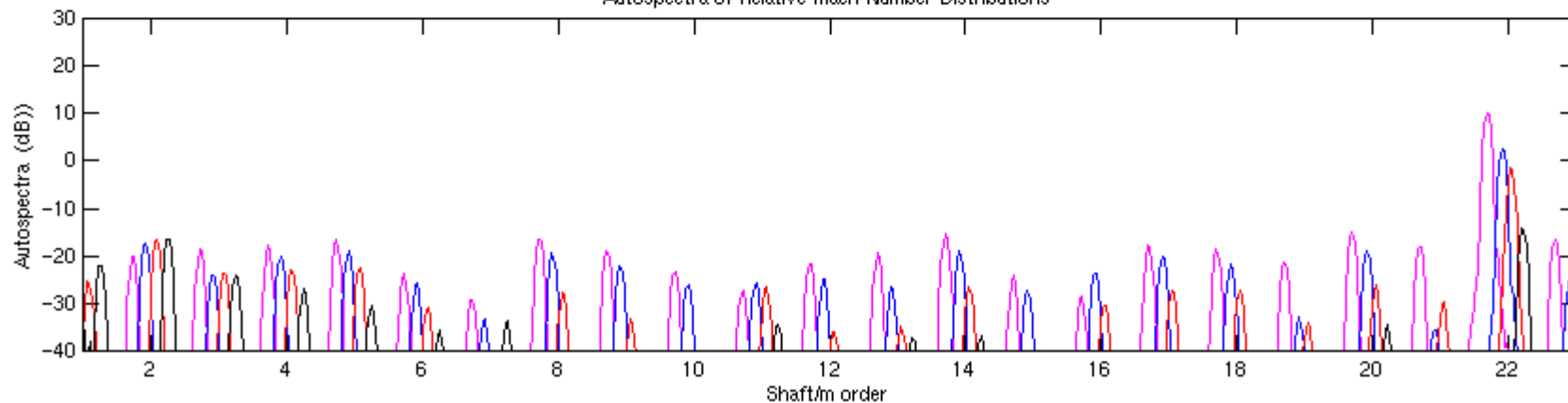


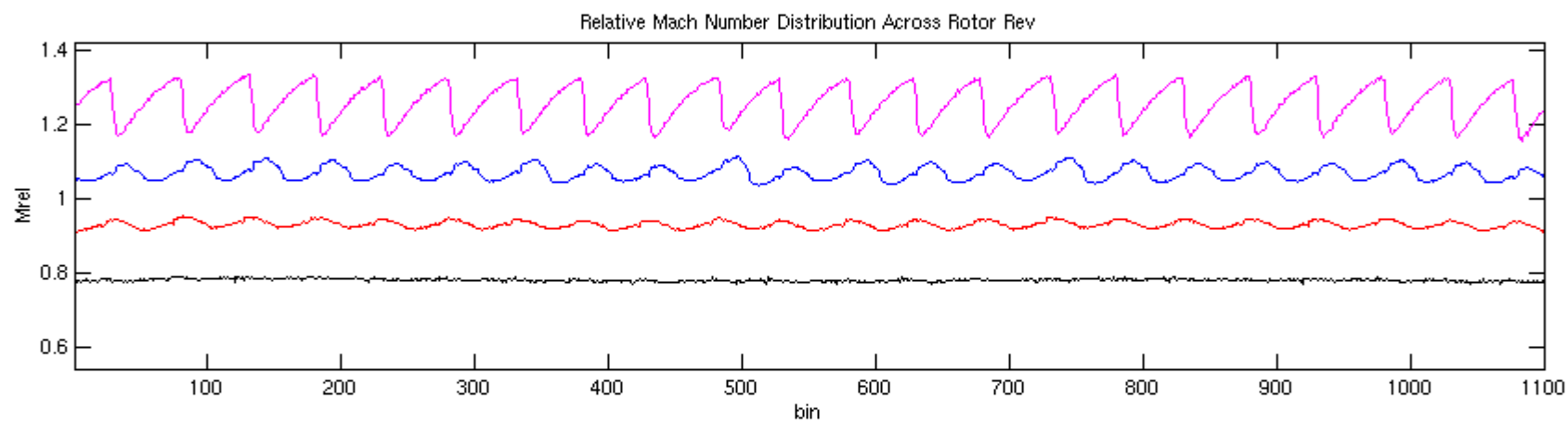
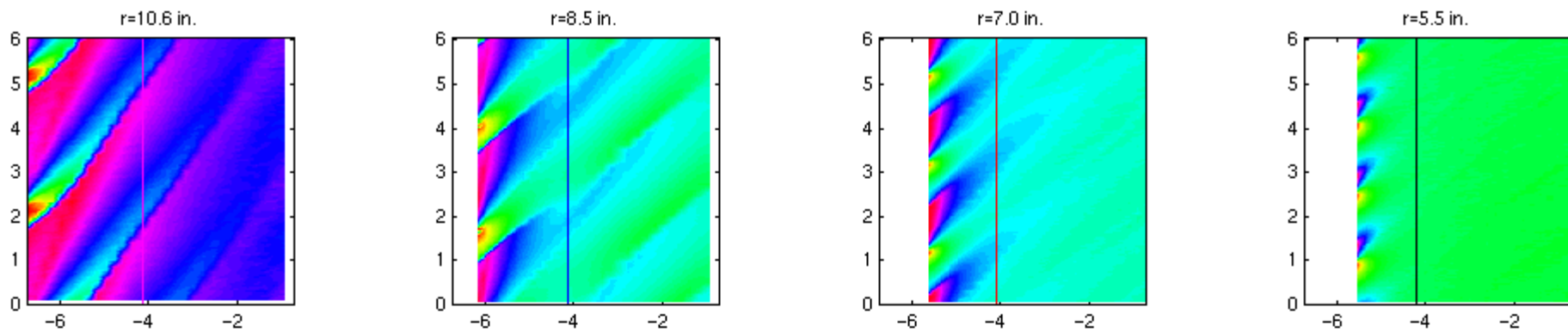
Relative Mach Number Distribution Across Rotor Rev



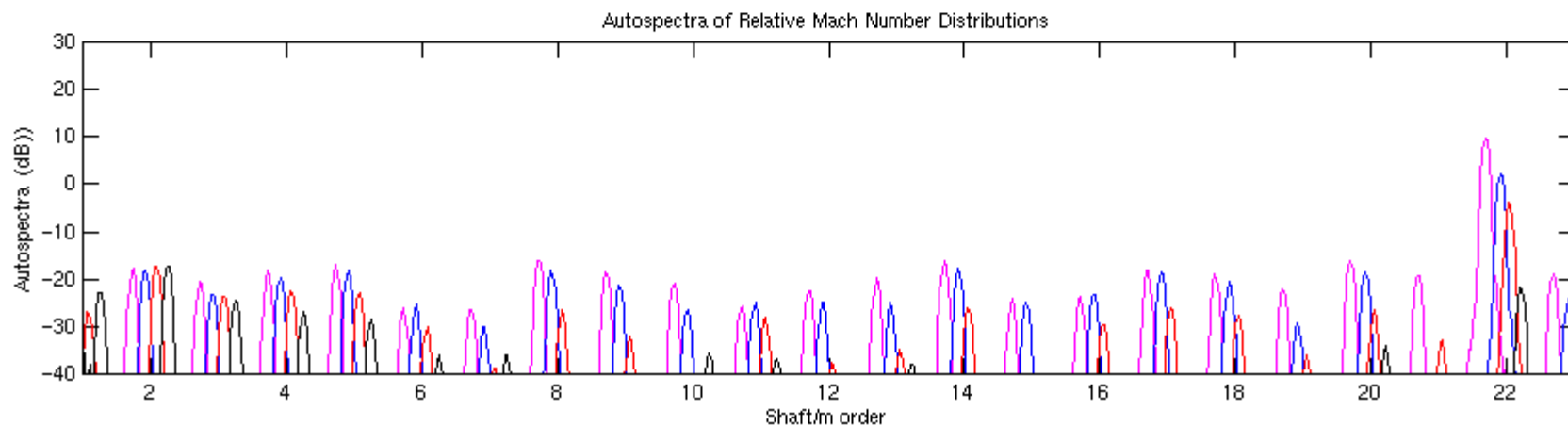
13

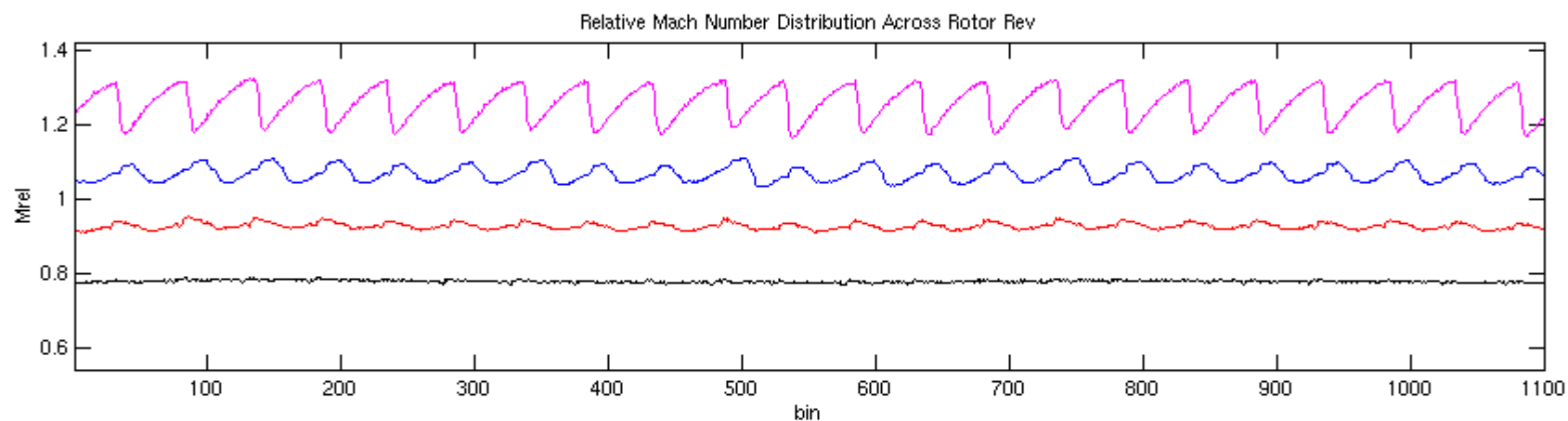
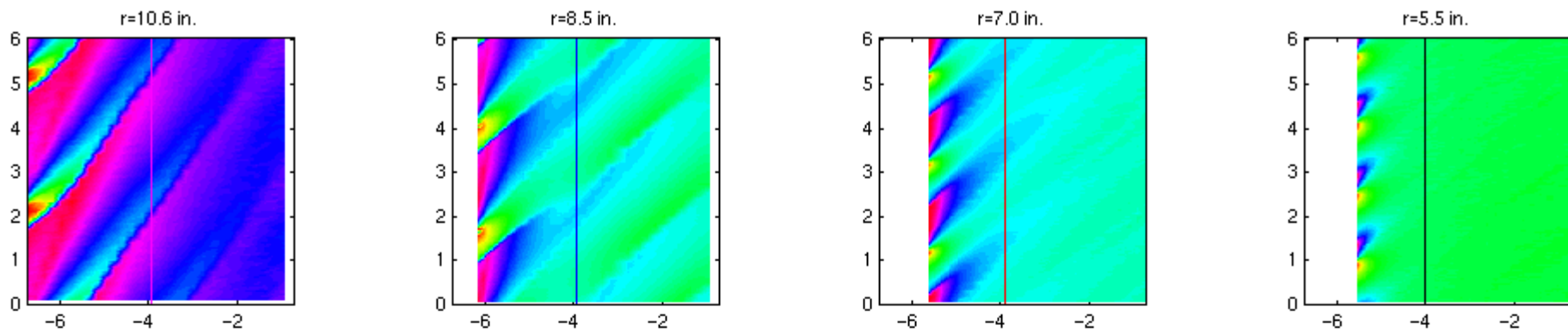
Autospectra of Relative Mach Number Distributions



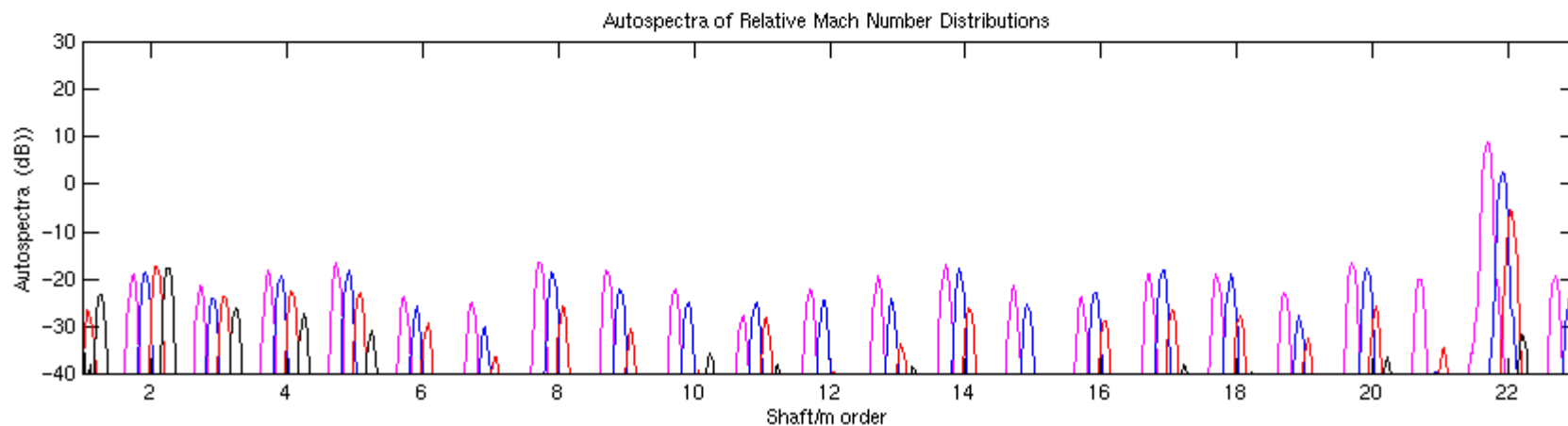


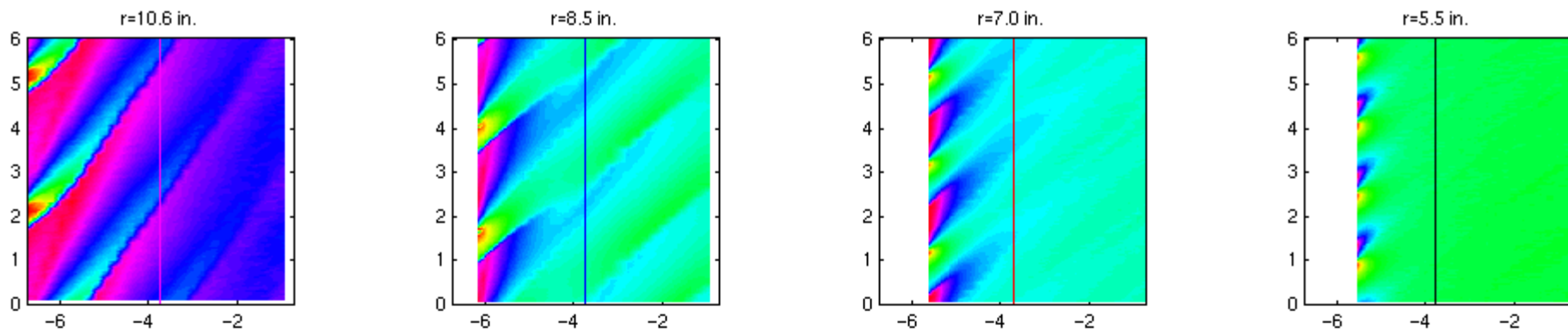
14



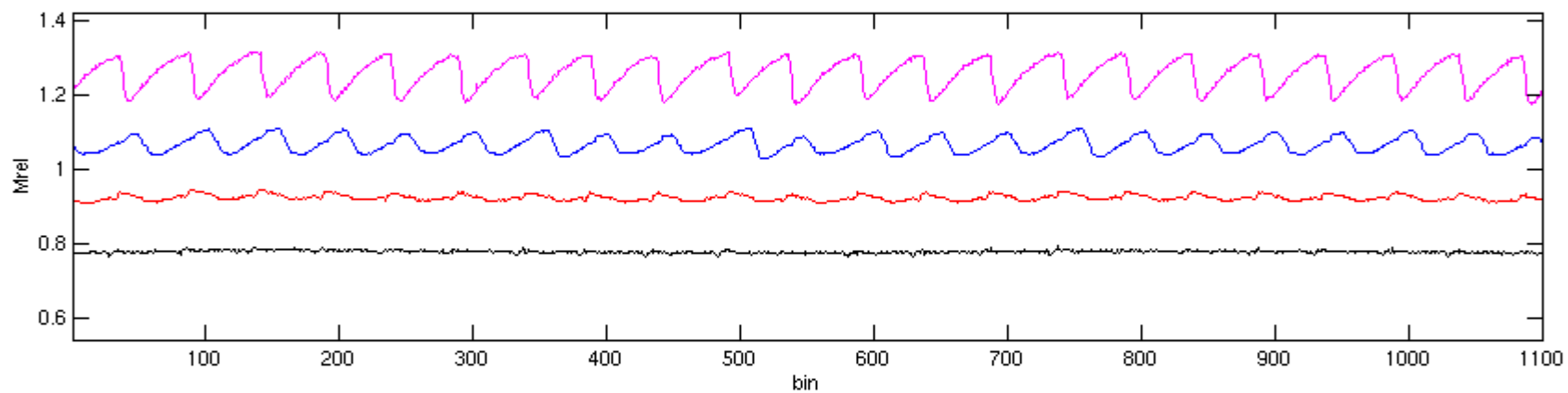


15



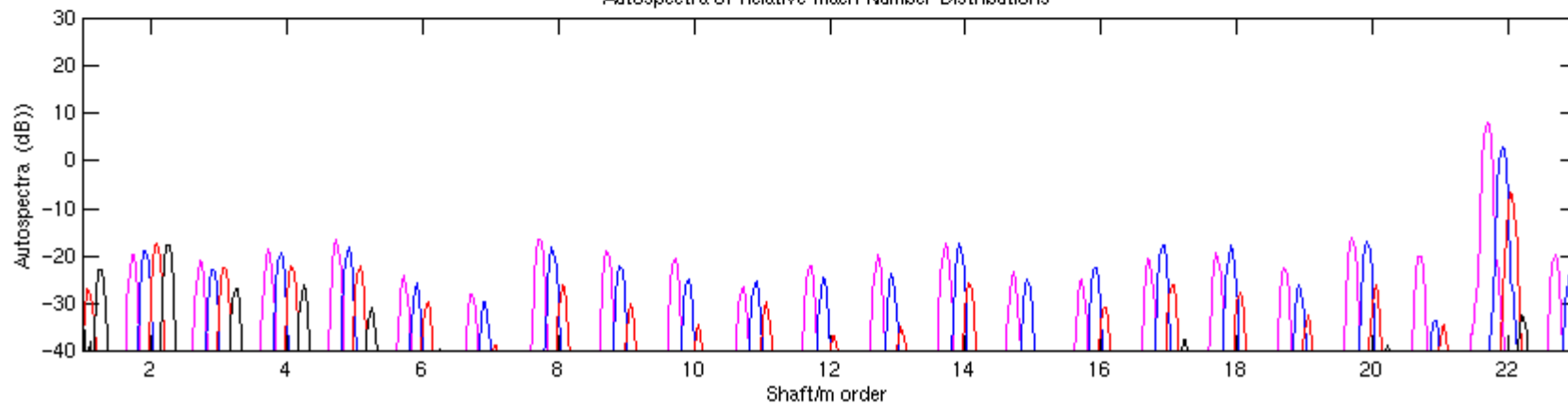


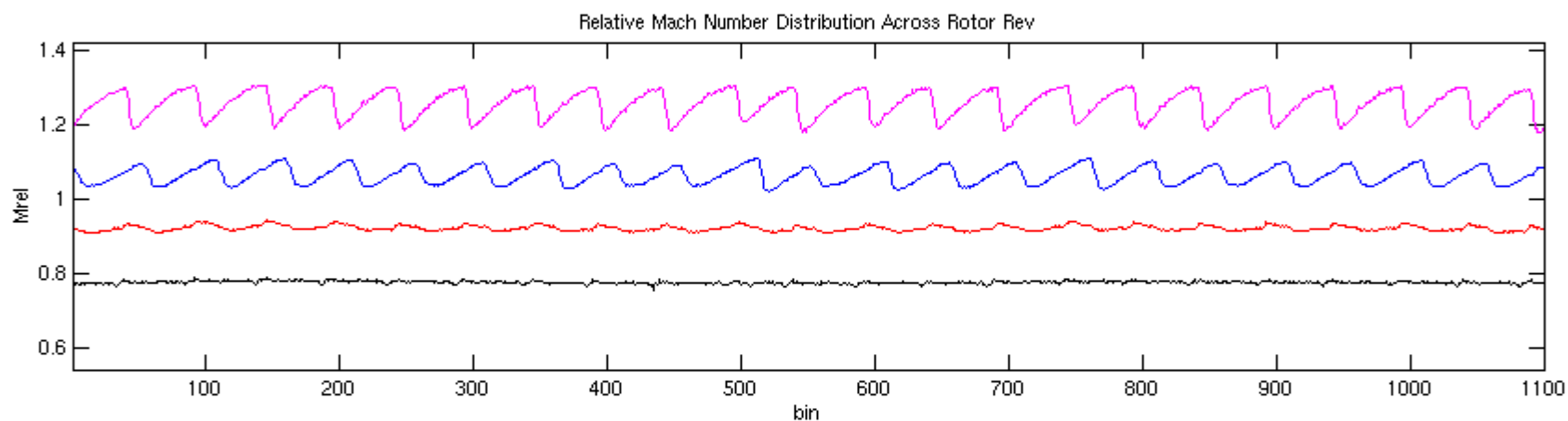
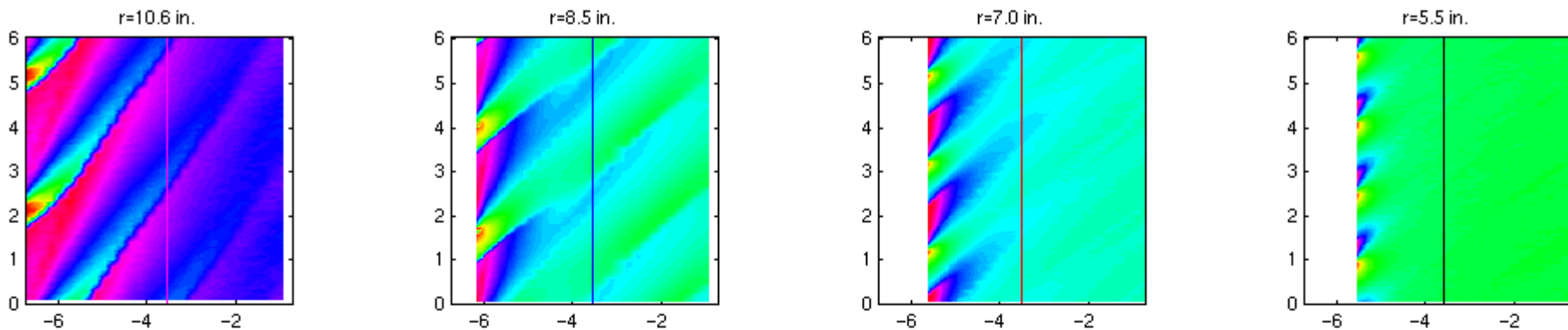
Relative Mach Number Distribution Across Rotor Rev



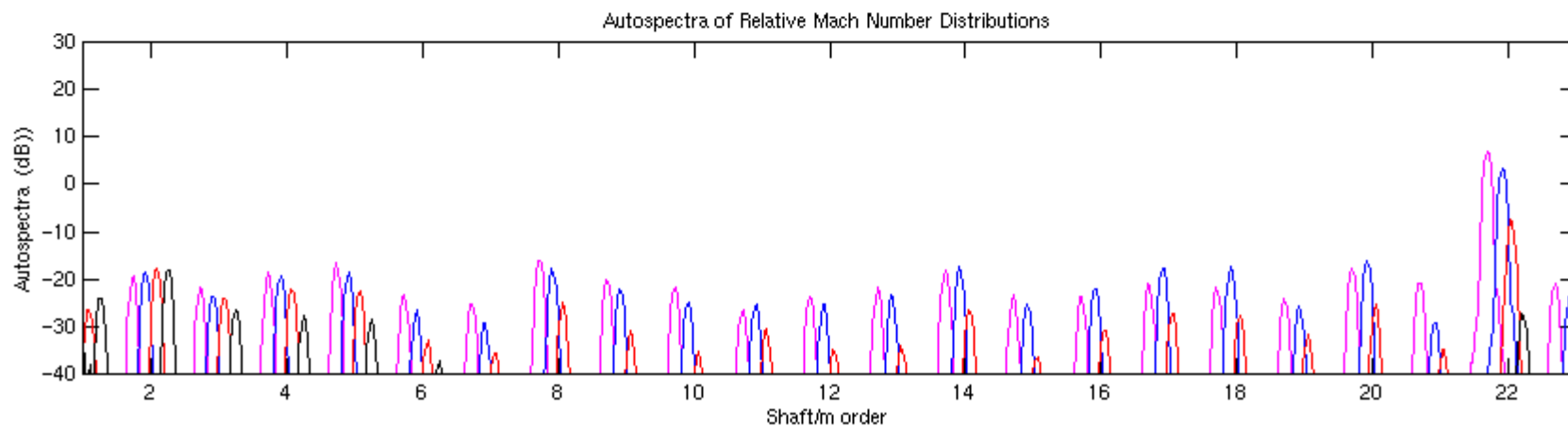
16

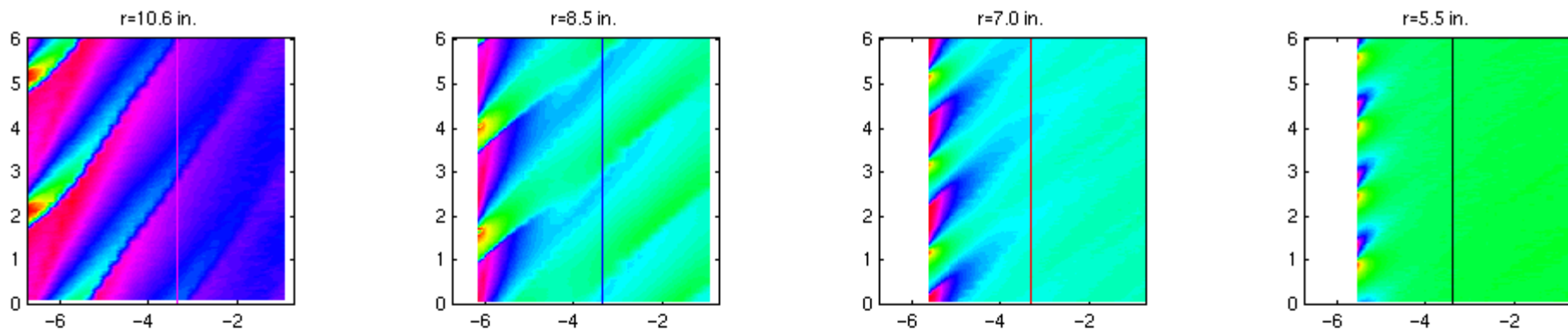
Autospectra of Relative Mach Number Distributions



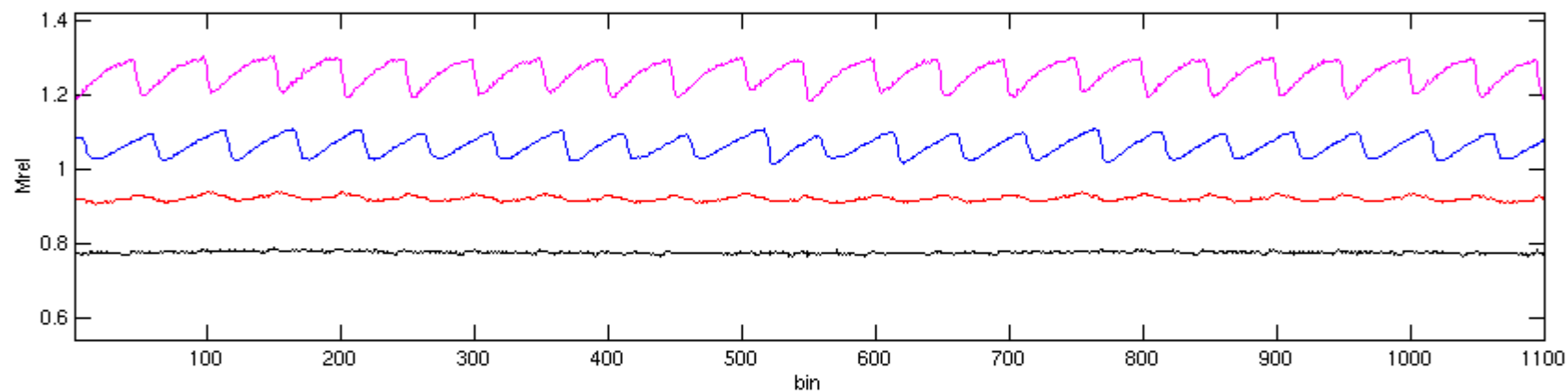


17



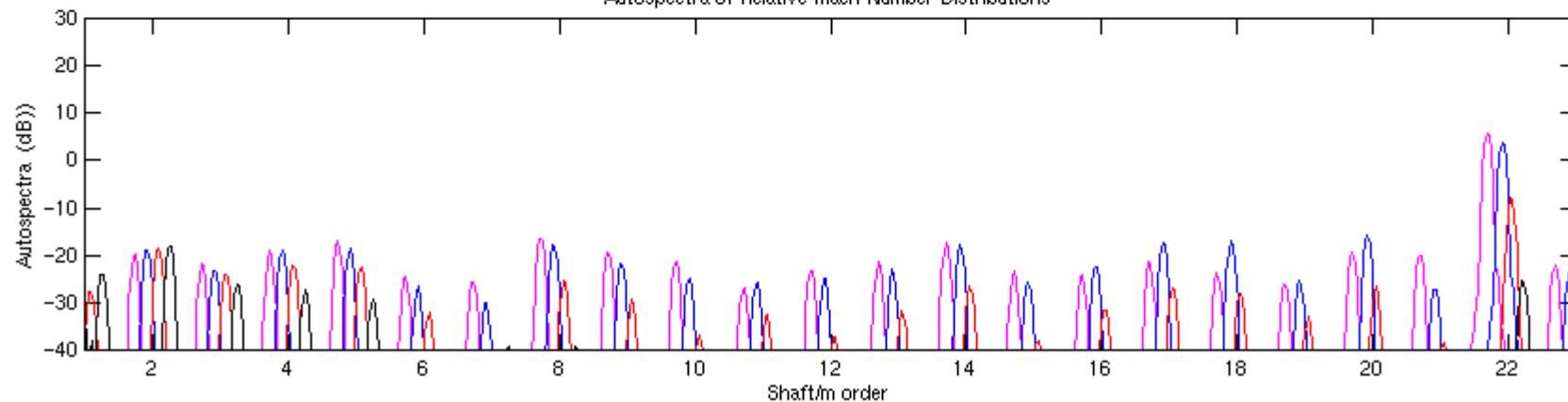


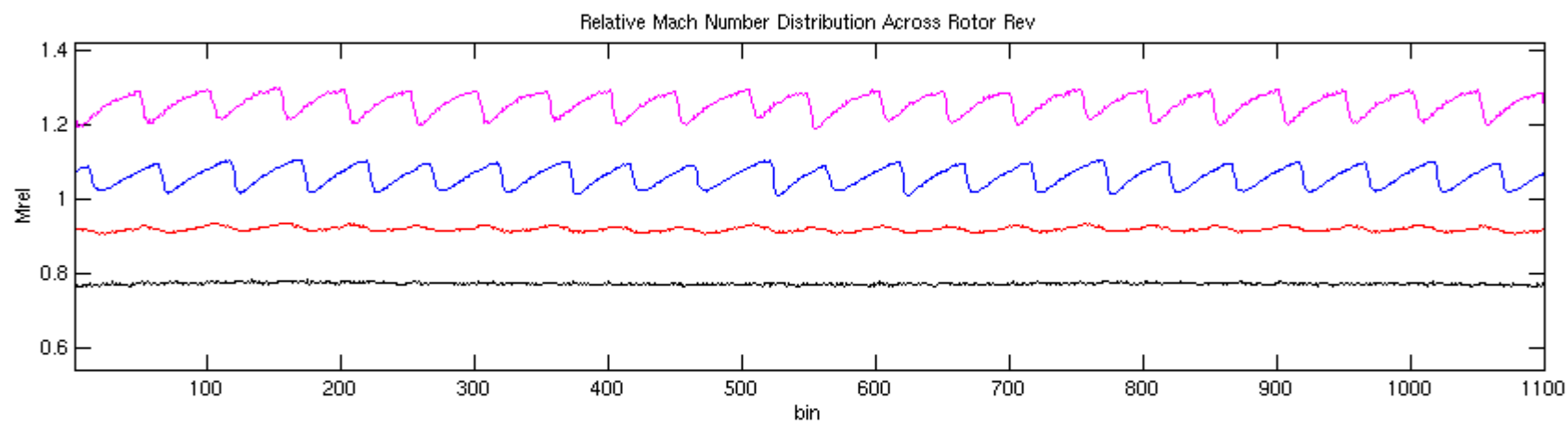
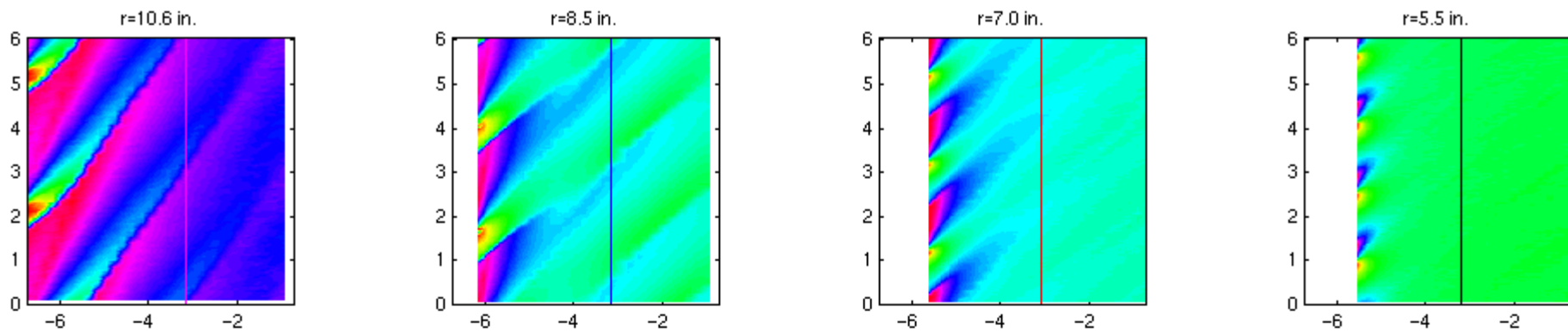
Relative Mach Number Distribution Across Rotor Rev



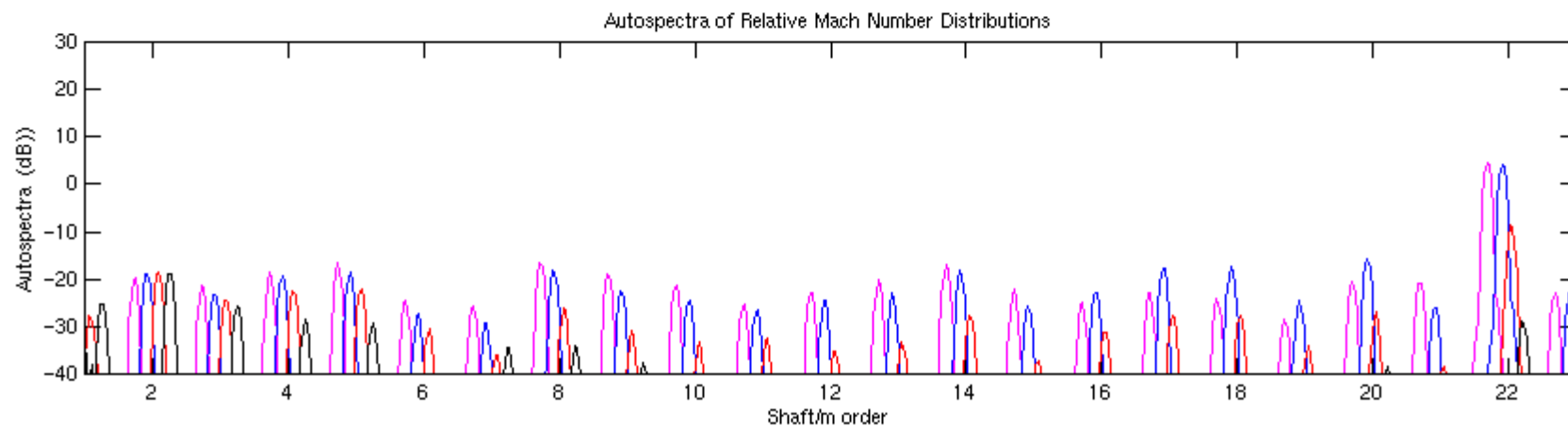
18

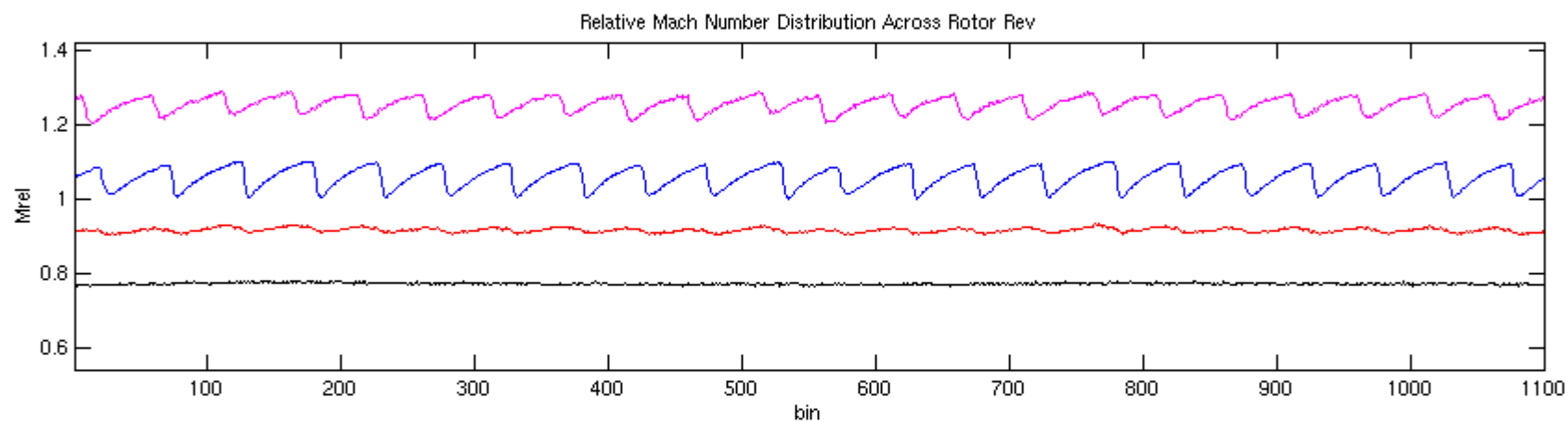
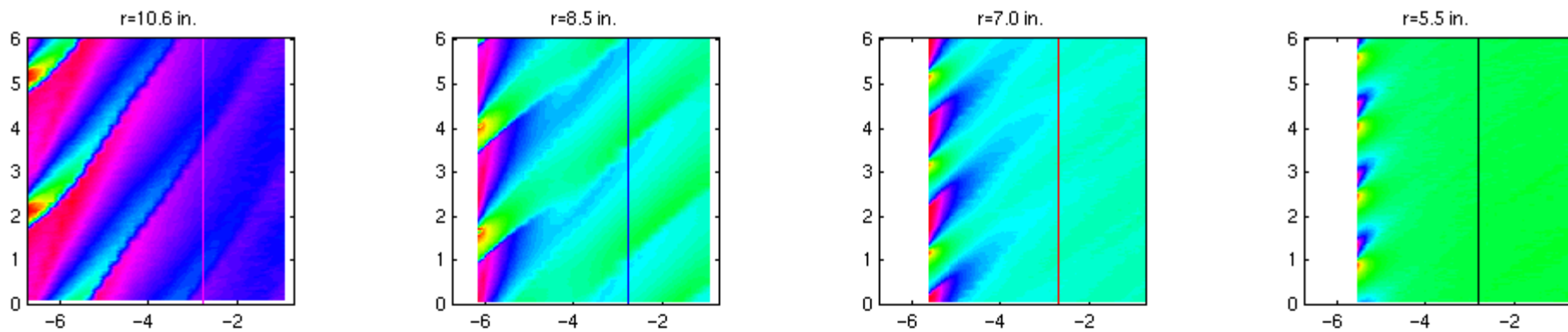
Autospectra of Relative Mach Number Distributions



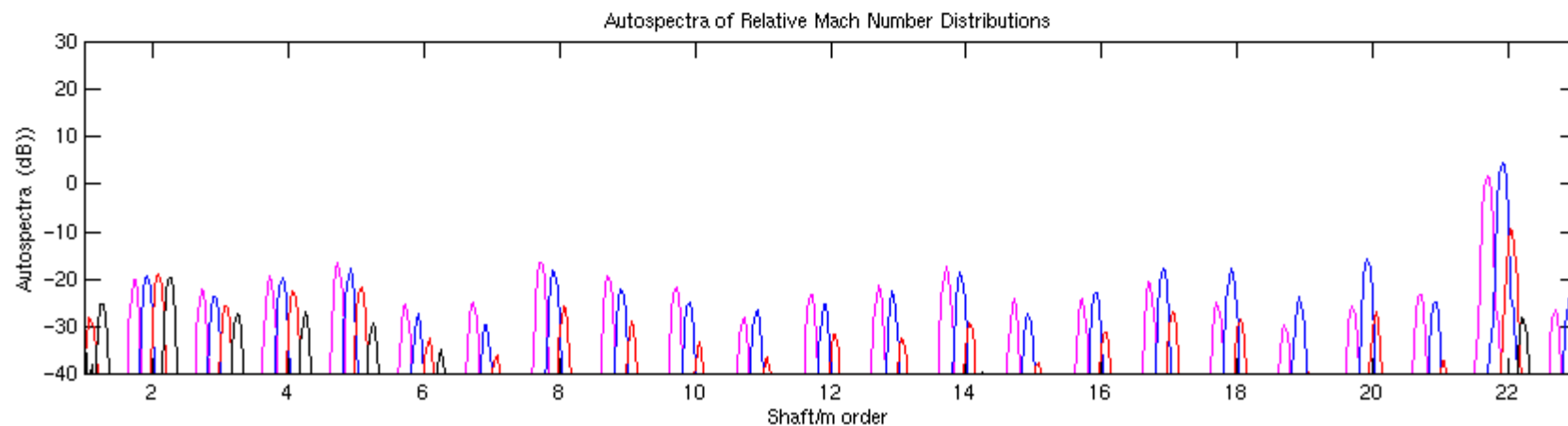


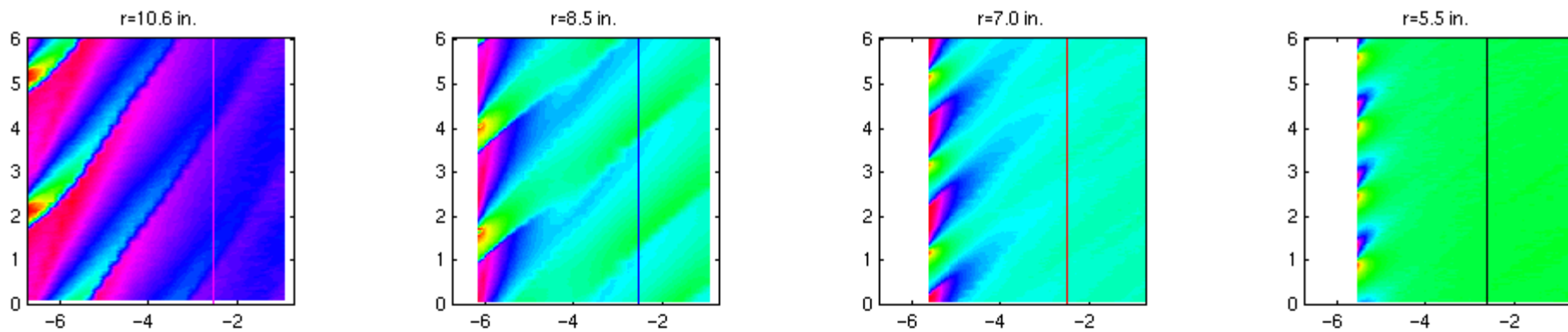
19



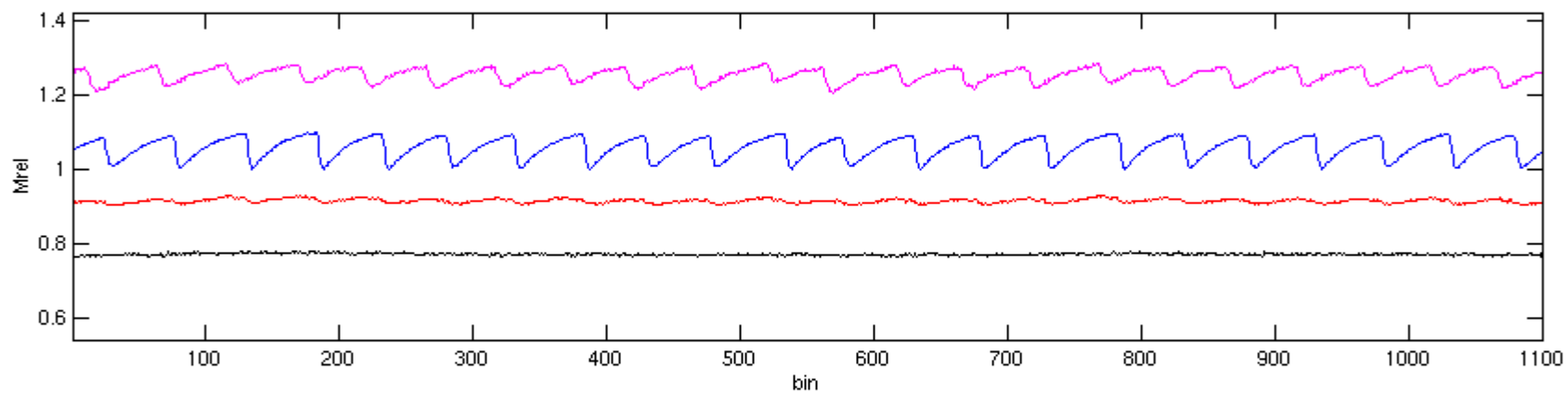


20



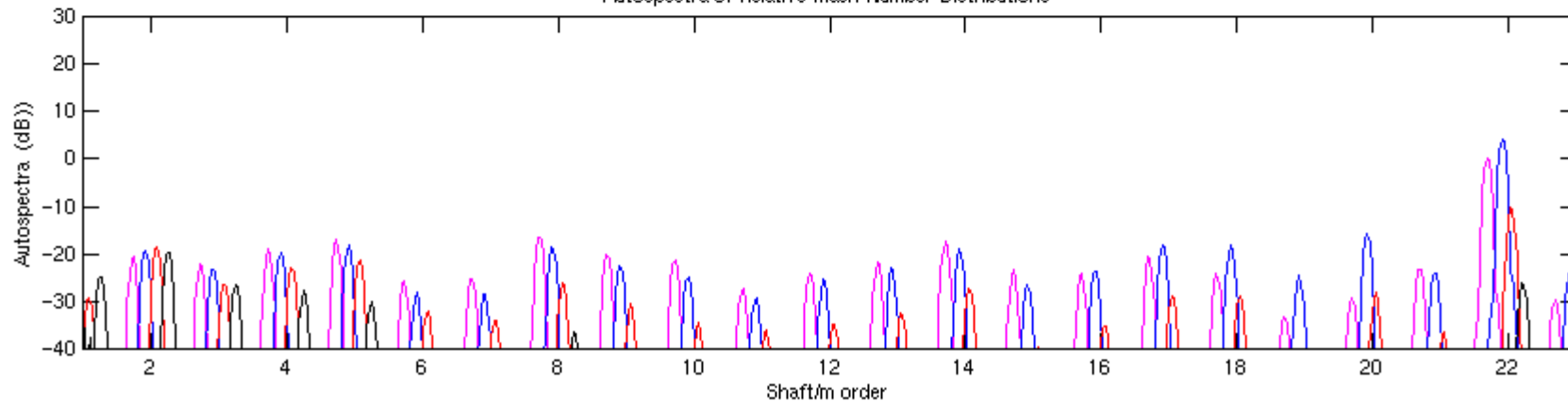


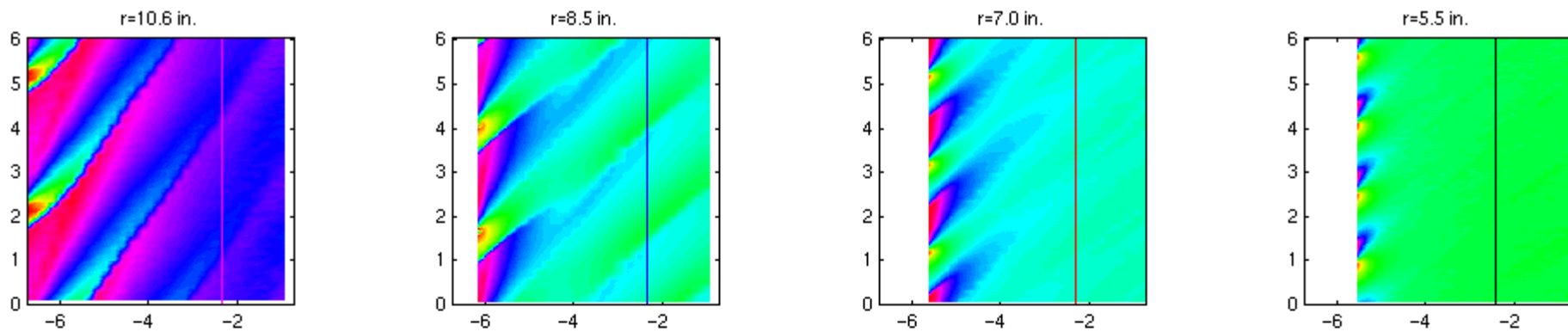
Relative Mach Number Distribution Across Rotor Rev



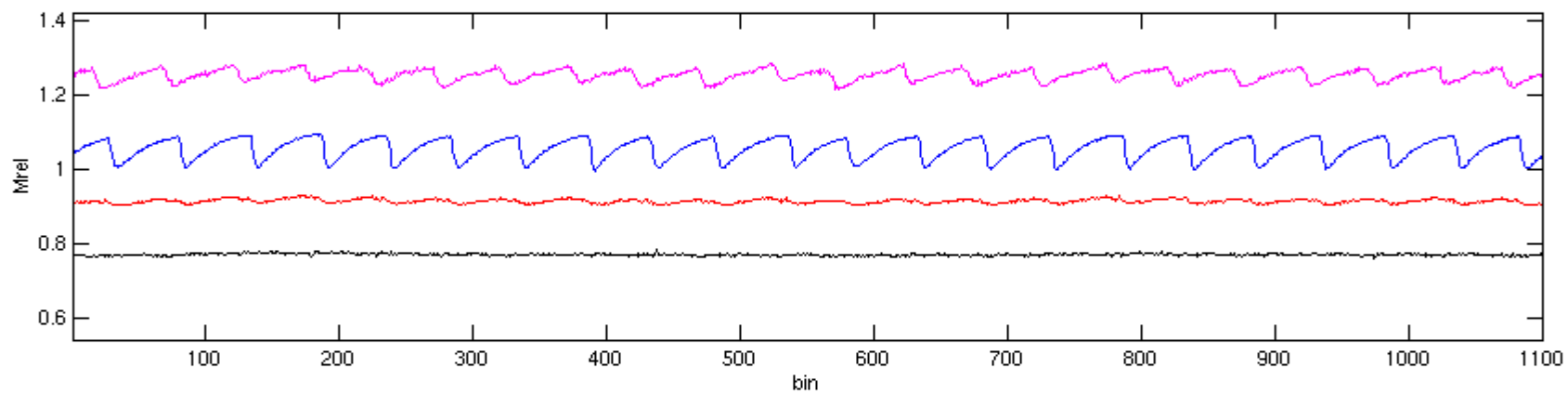
21

Autospectra of Relative Mach Number Distributions



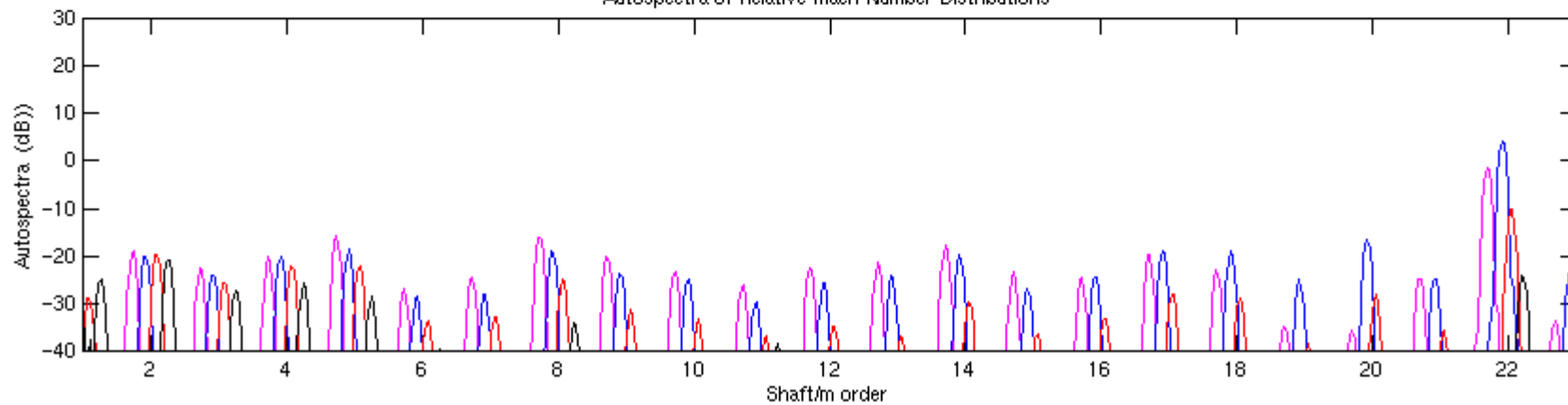


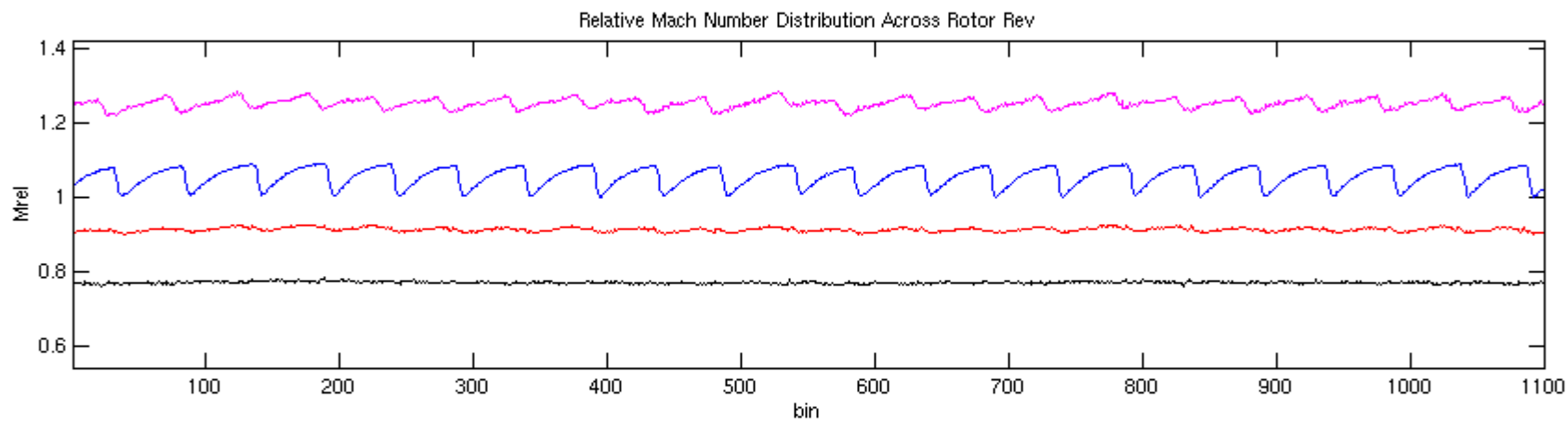
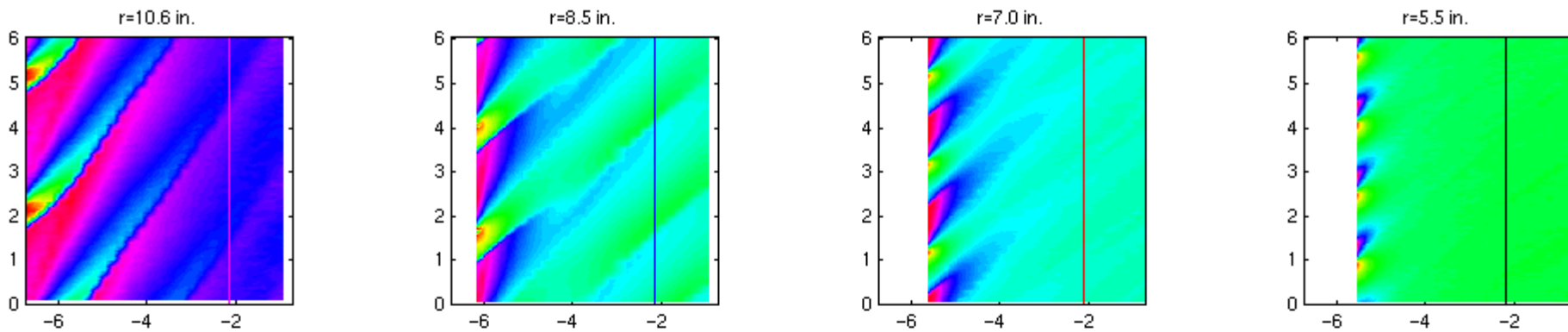
Relative Mach Number Distribution Across Rotor Rev



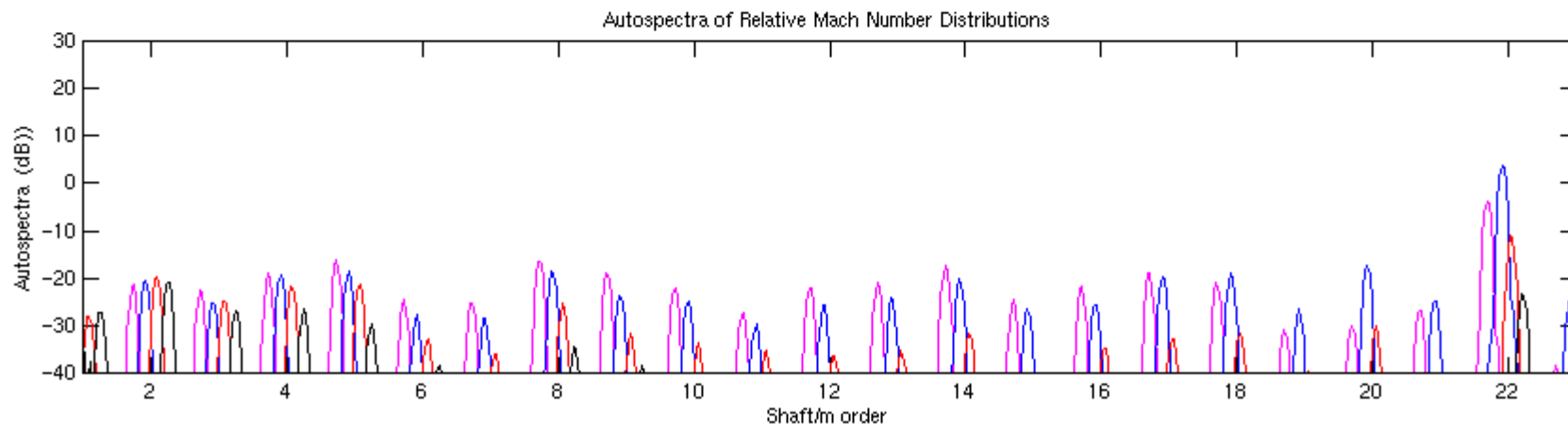
22

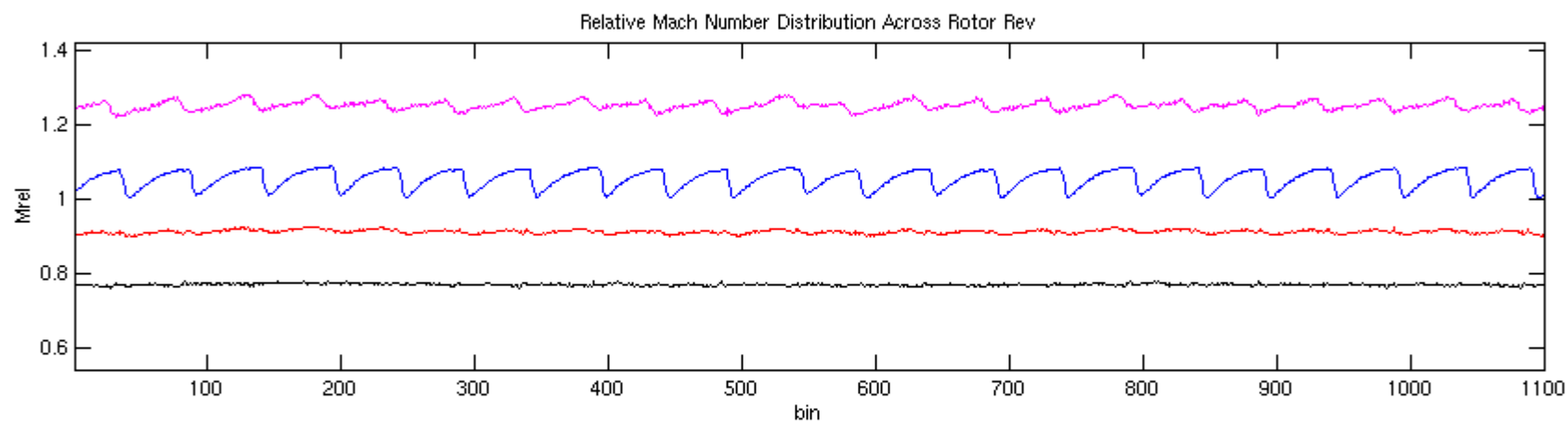
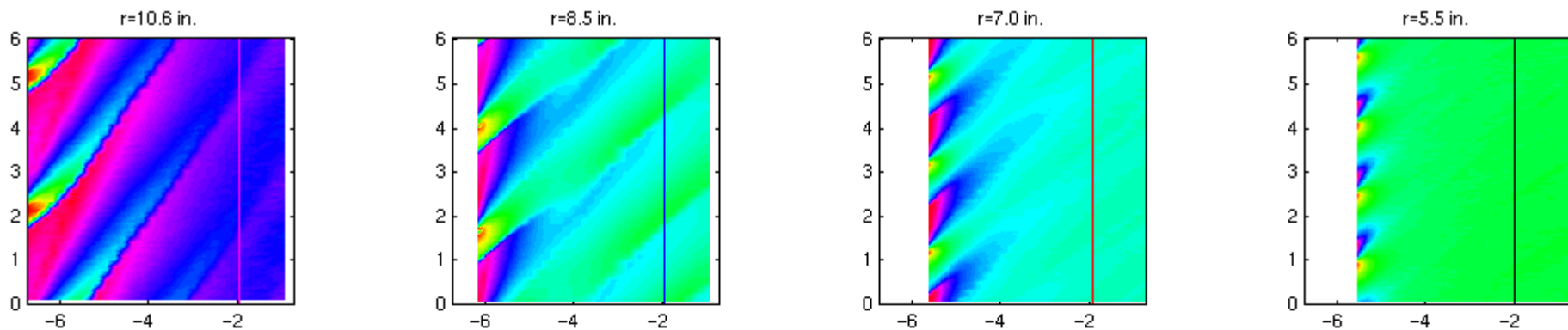
Autospectra of Relative Mach Number Distributions



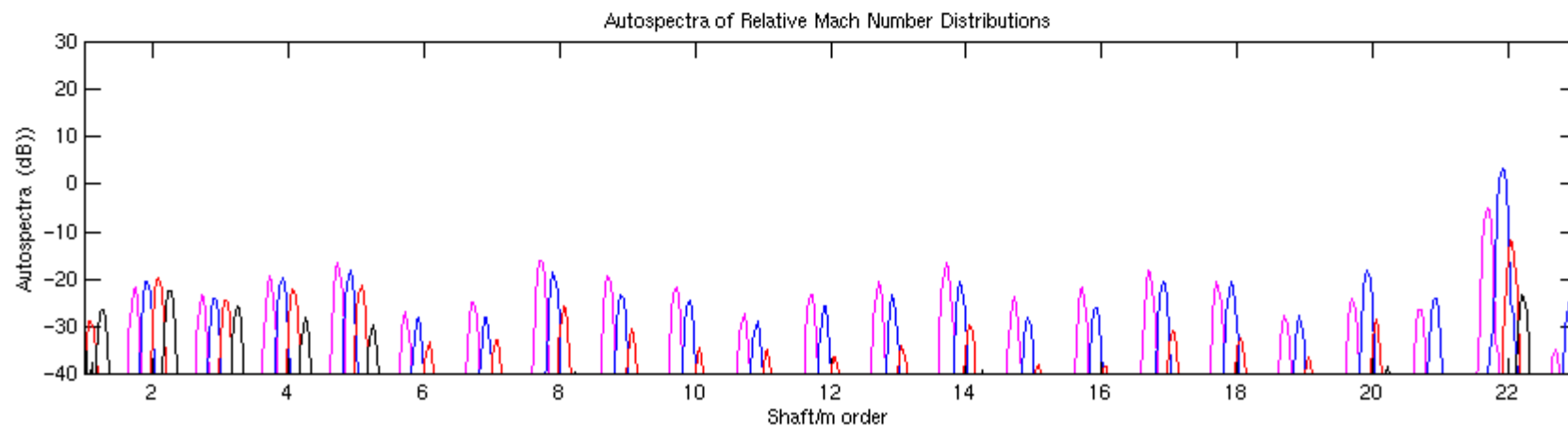


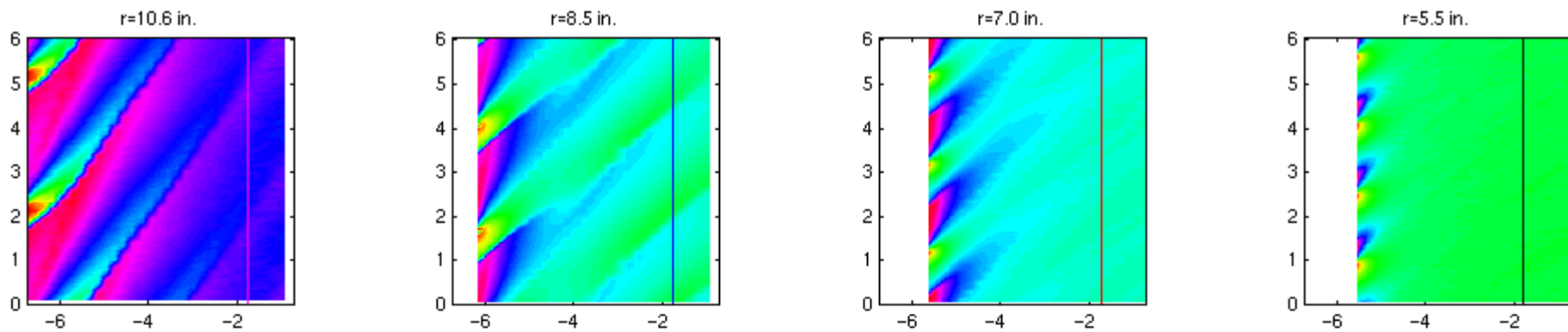
23



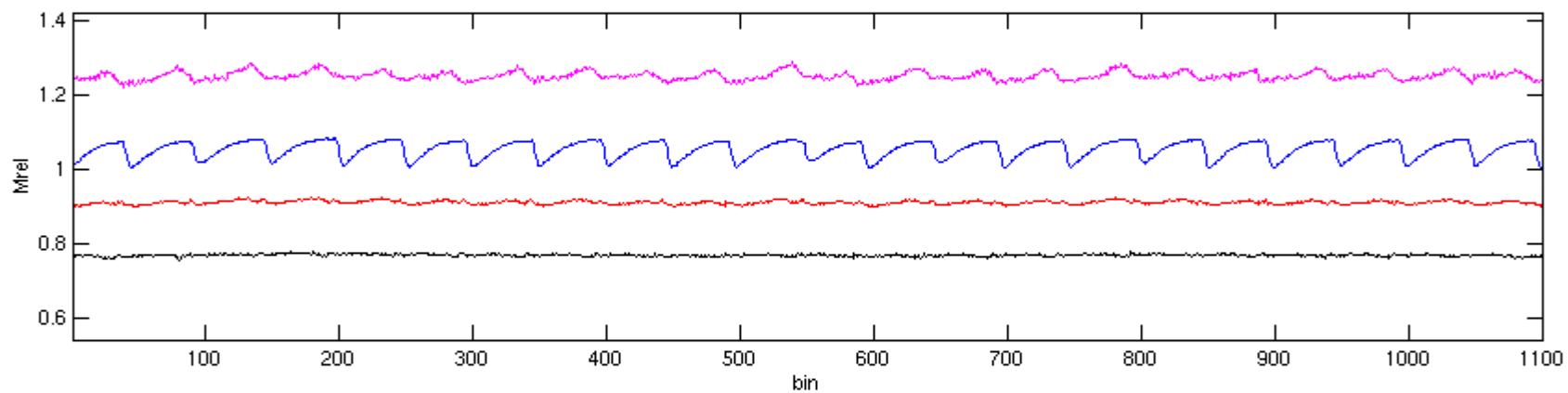


24



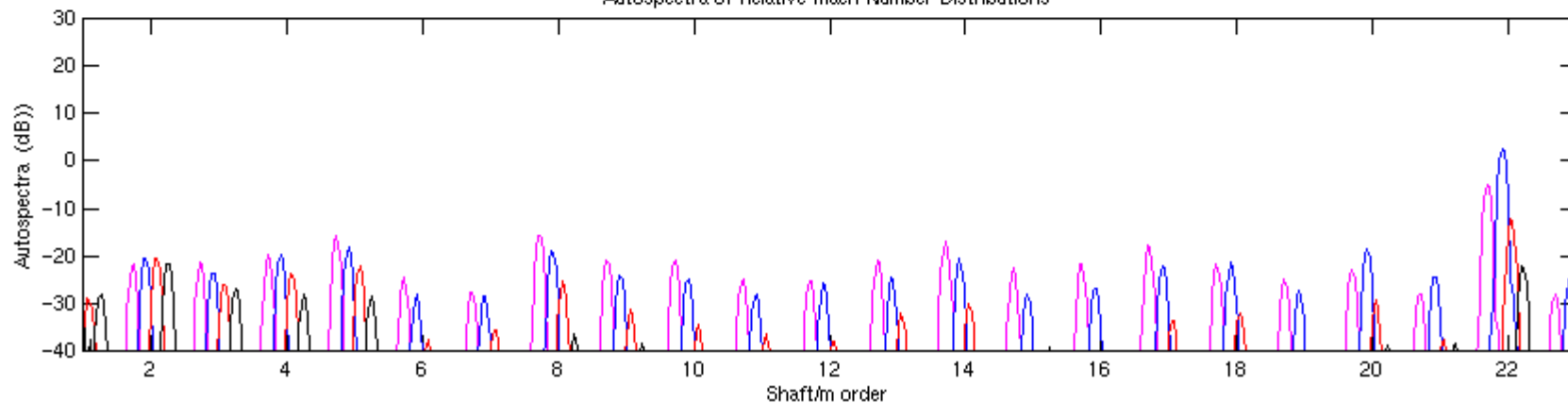


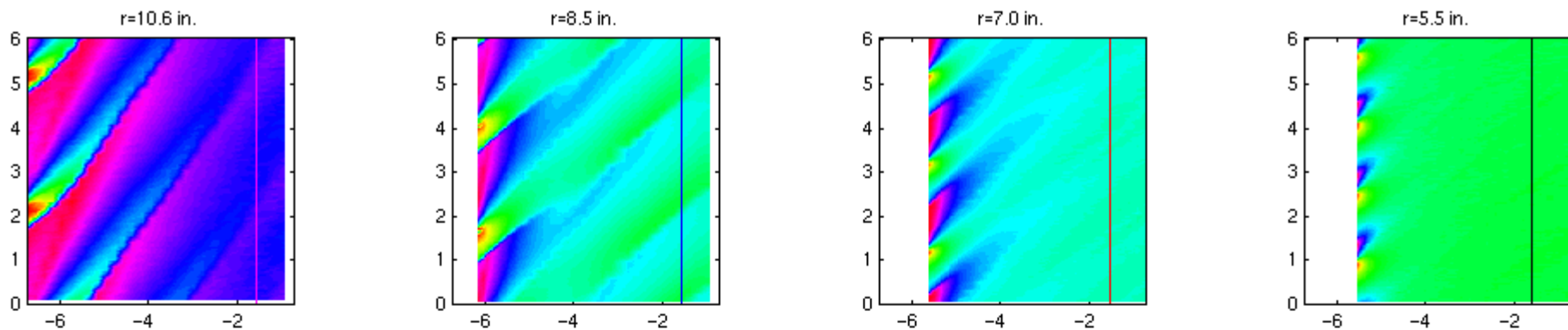
Relative Mach Number Distribution Across Rotor Rev



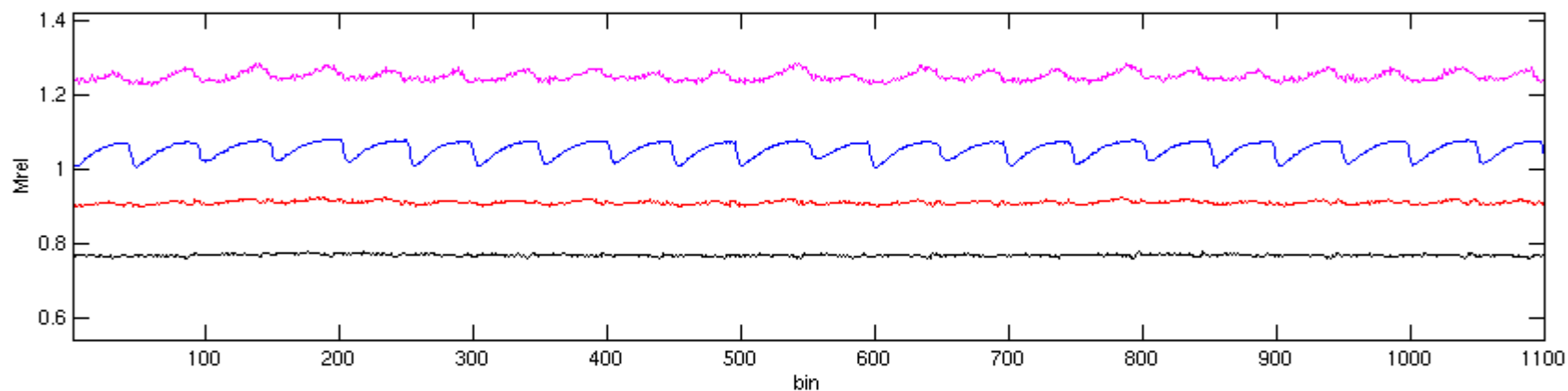
25

Autospectra of Relative Mach Number Distributions



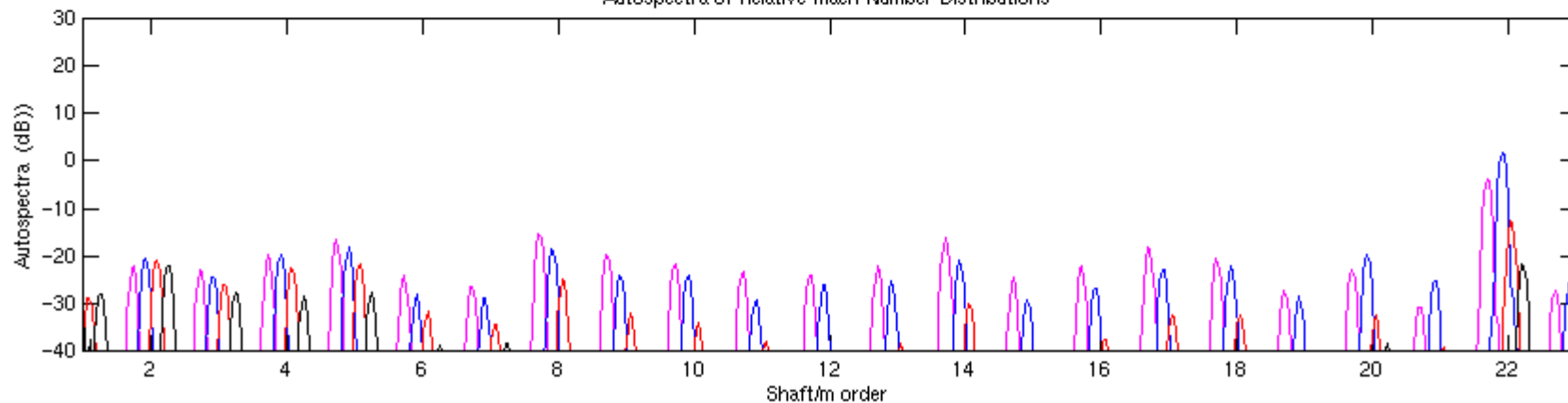


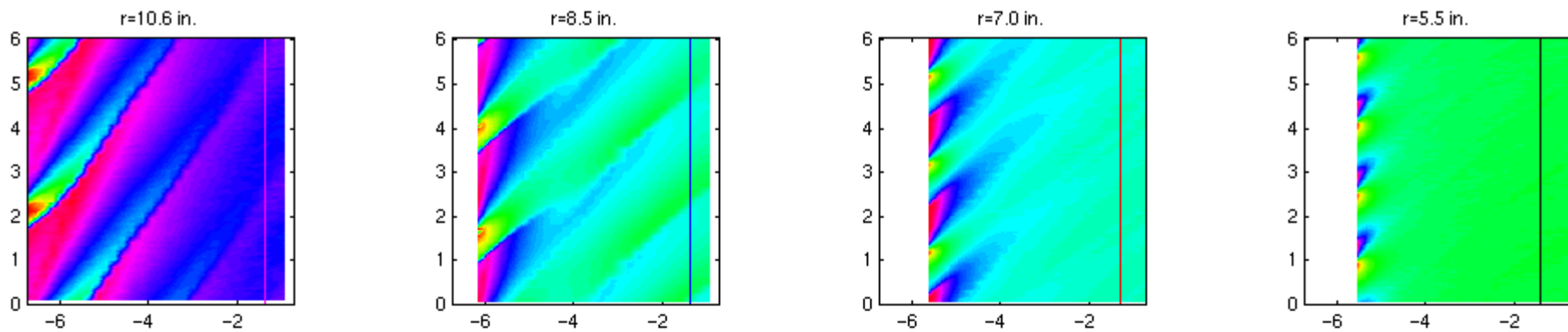
Relative Mach Number Distribution Across Rotor Rev



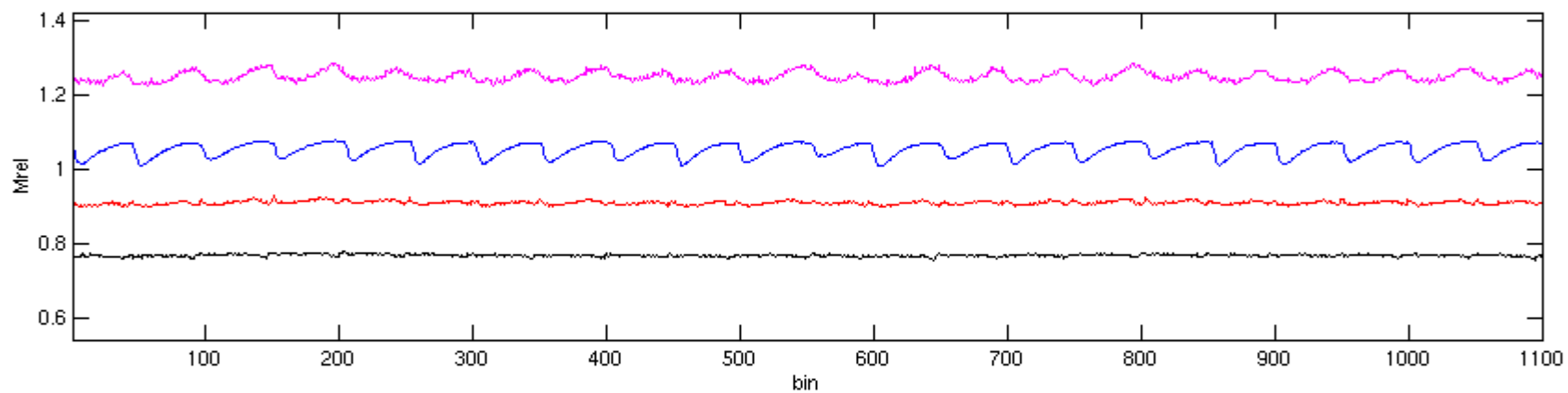
26

Autospectra of Relative Mach Number Distributions



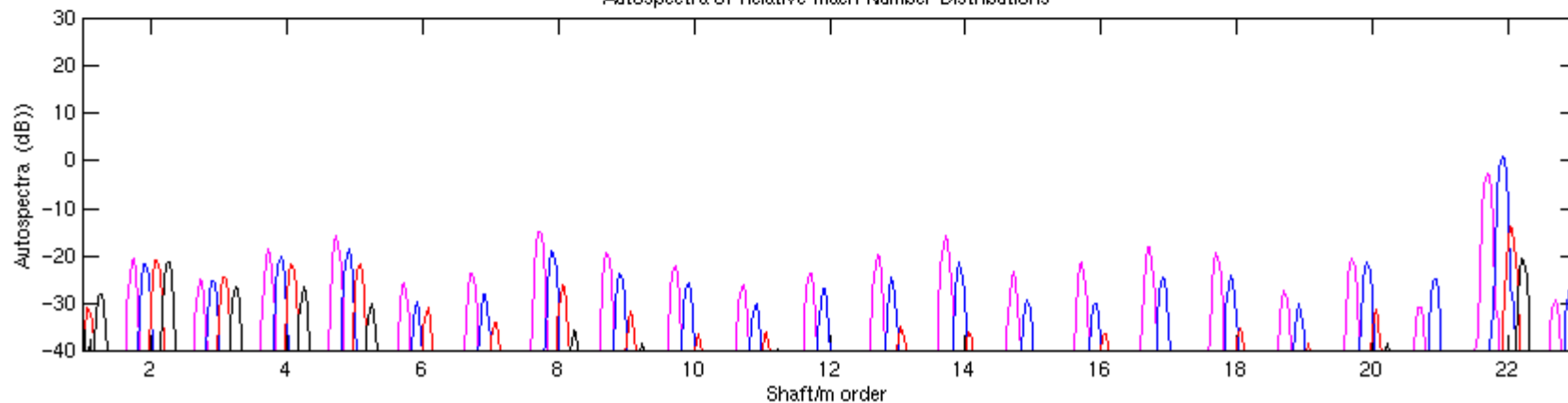


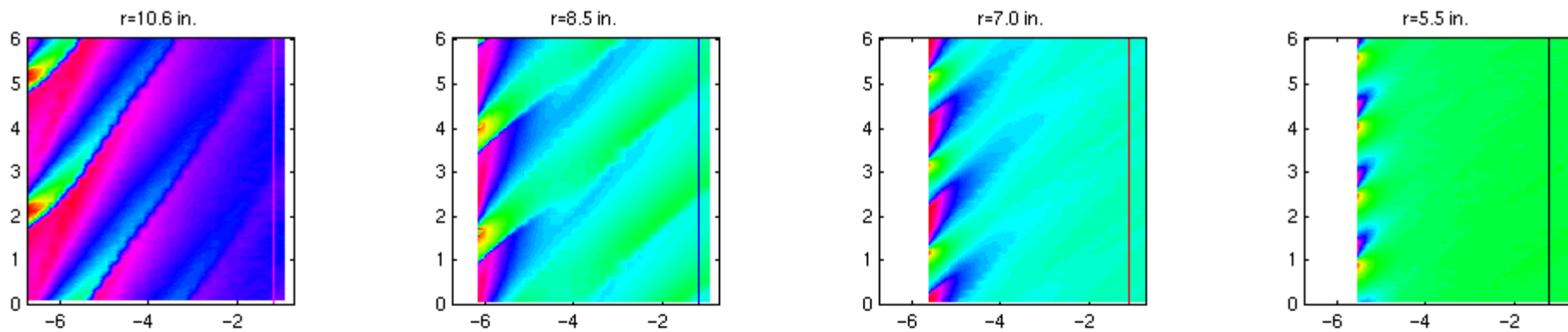
Relative Mach Number Distribution Across Rotor Rev



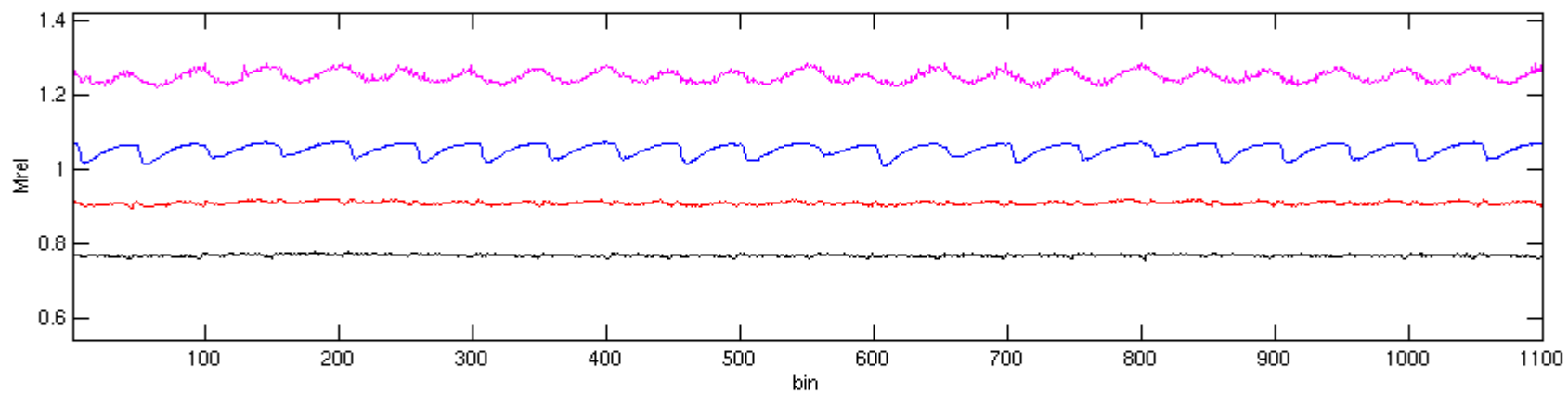
27

Autospectra of Relative Mach Number Distributions



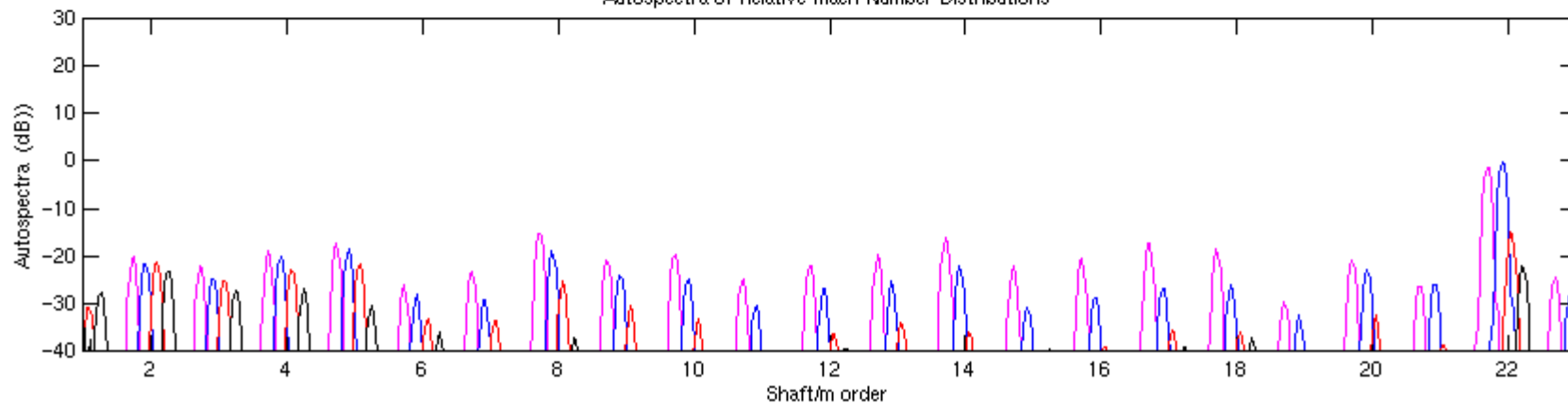


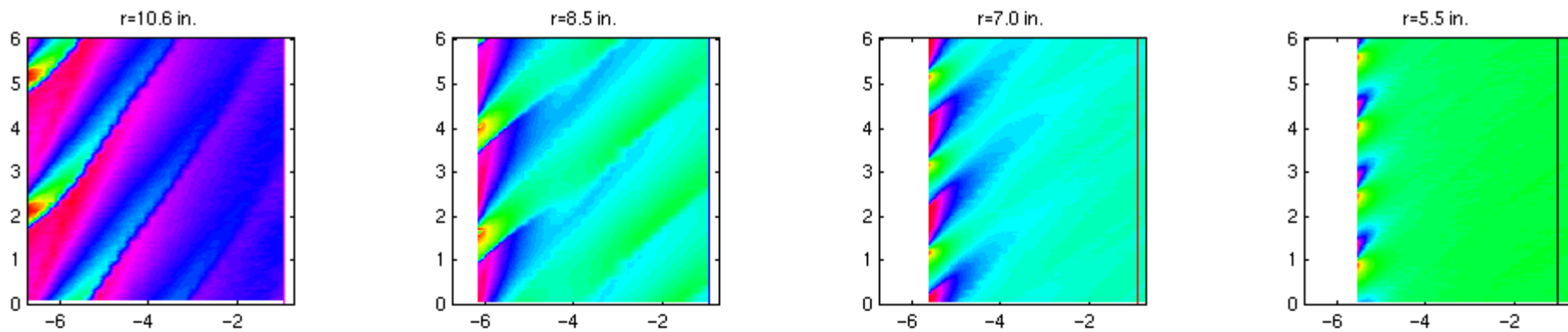
Relative Mach Number Distribution Across Rotor Rev



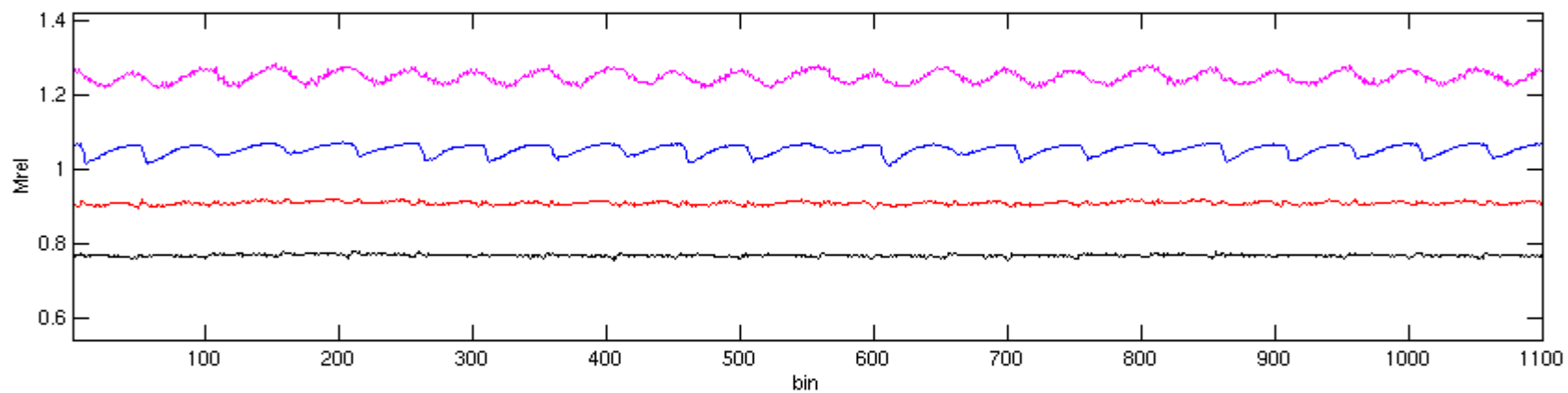
28

Autospectra of Relative Mach Number Distributions





Relative Mach Number Distribution Across Rotor Rev



29

Autospectra of Relative Mach Number Distributions

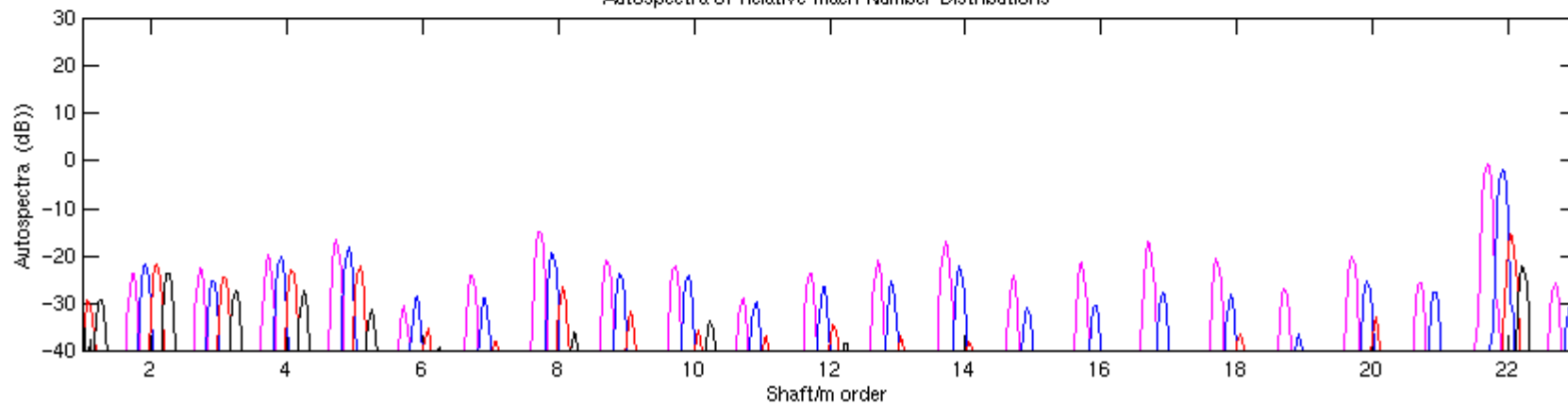
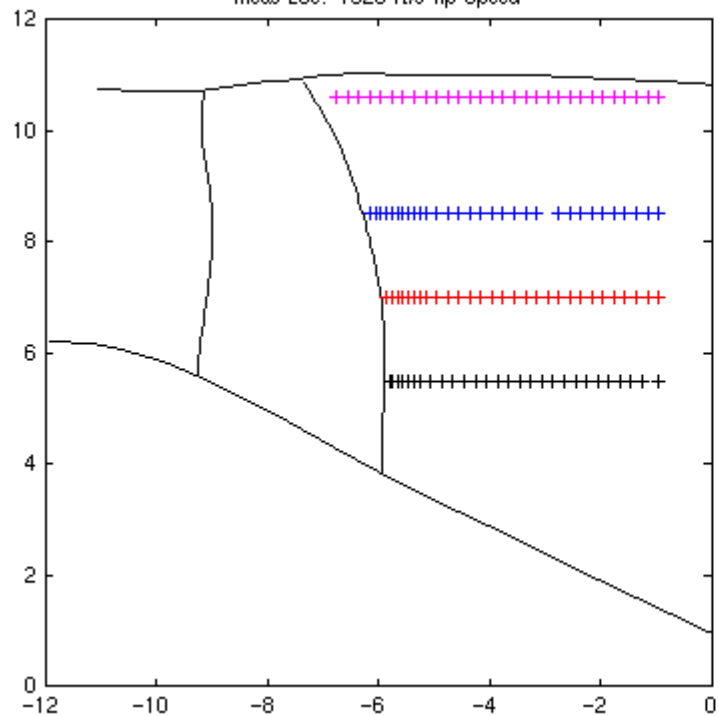


Figure 24.—Variation in the average amplitude of the disturbance measured upstream of the aft-swept fan with distance upstream of the leading edge.

Meas Loc. 1328 ft/s Tip Speed



Decay of Relative Mach Number Disturbance vs. Axial Distance Upstream of LE 1328 ft/s Tip Speed

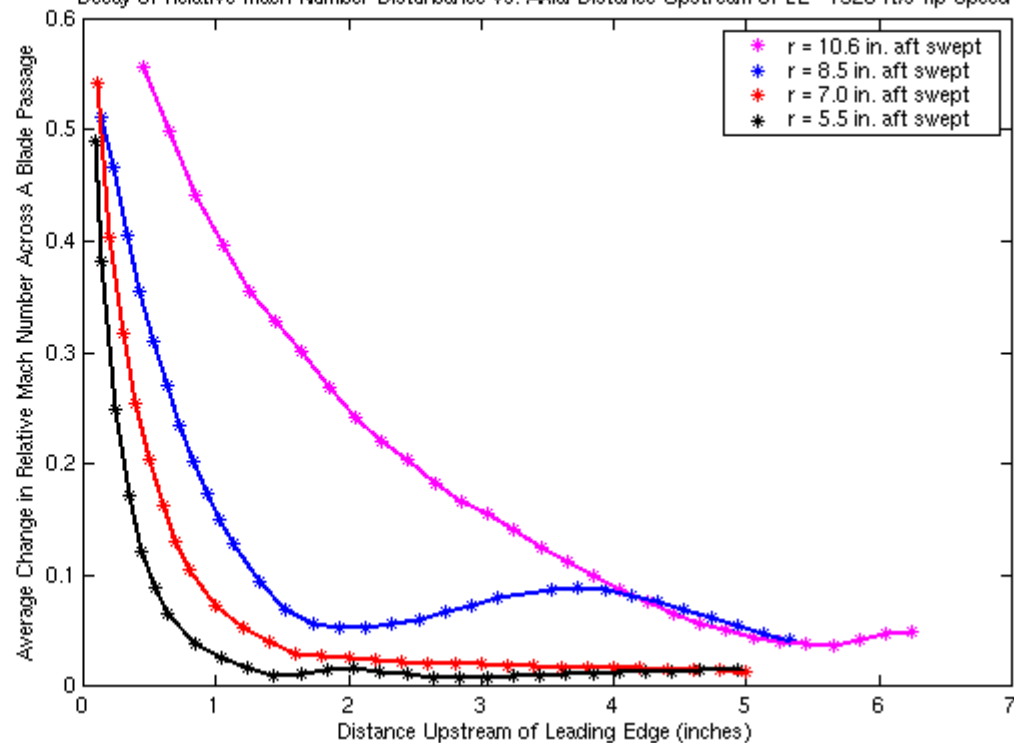
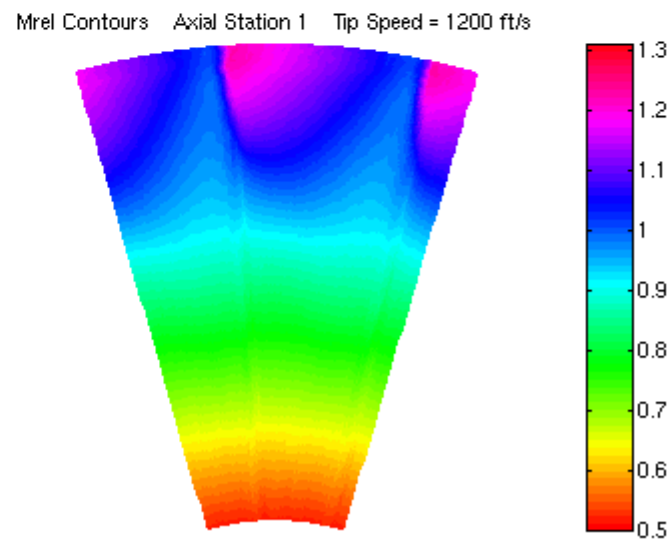
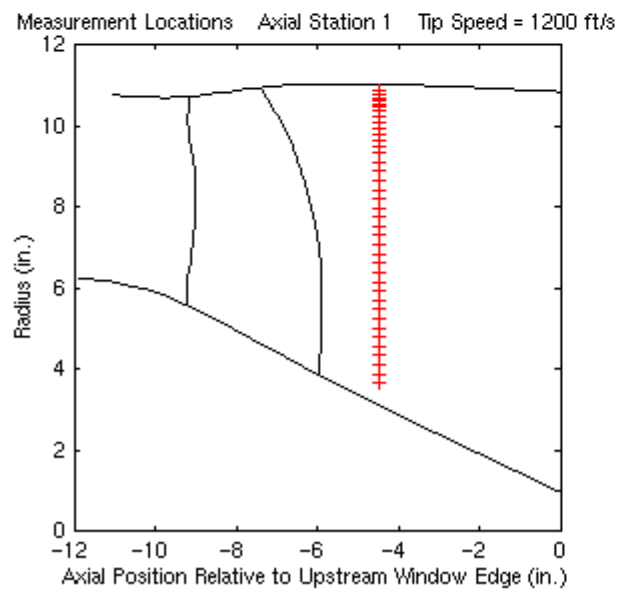
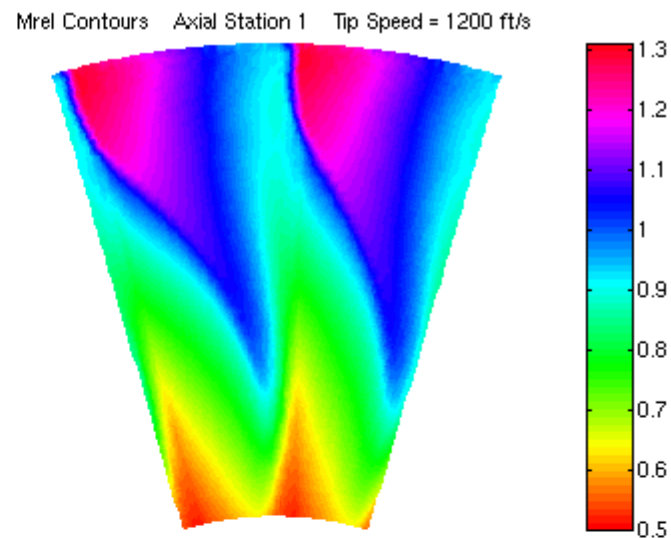
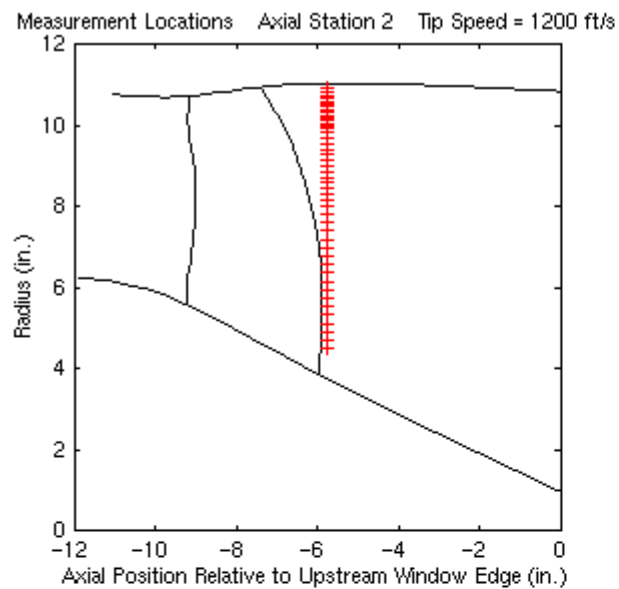
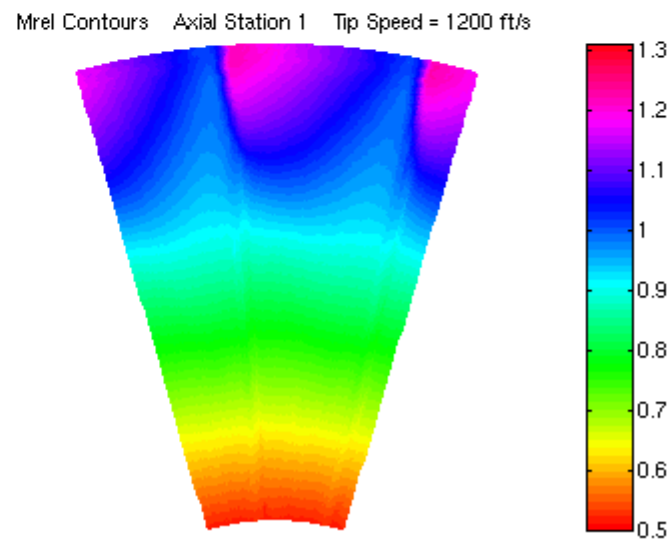
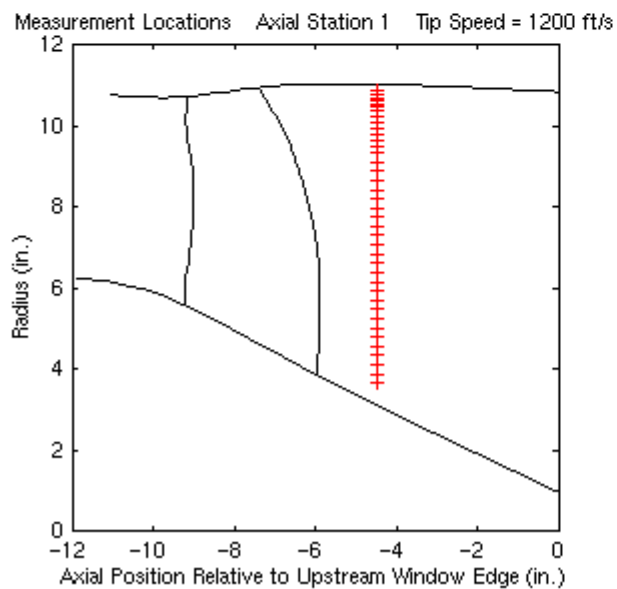
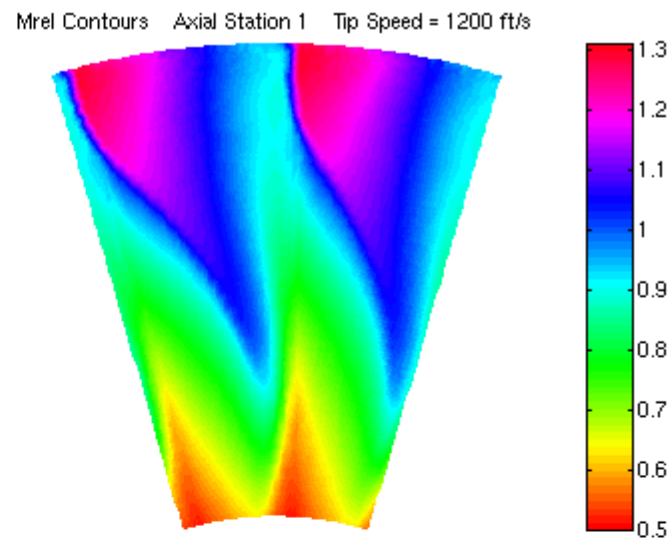
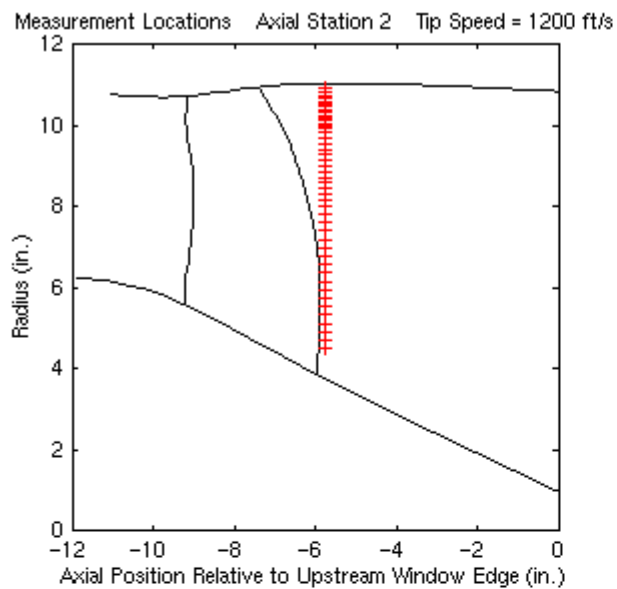
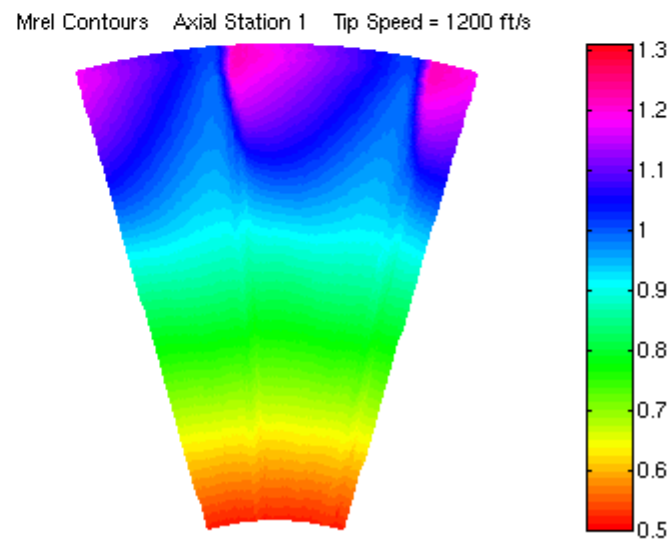
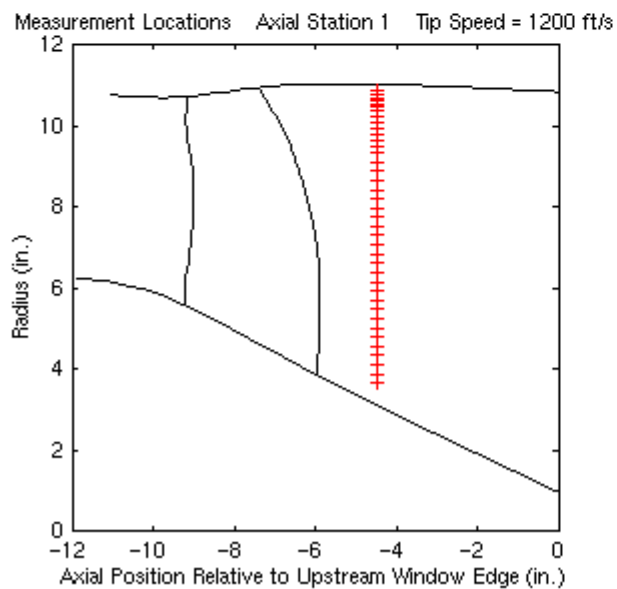
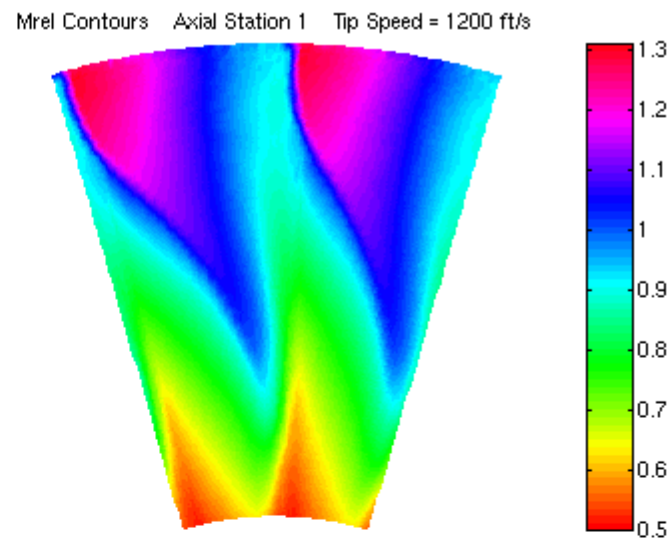
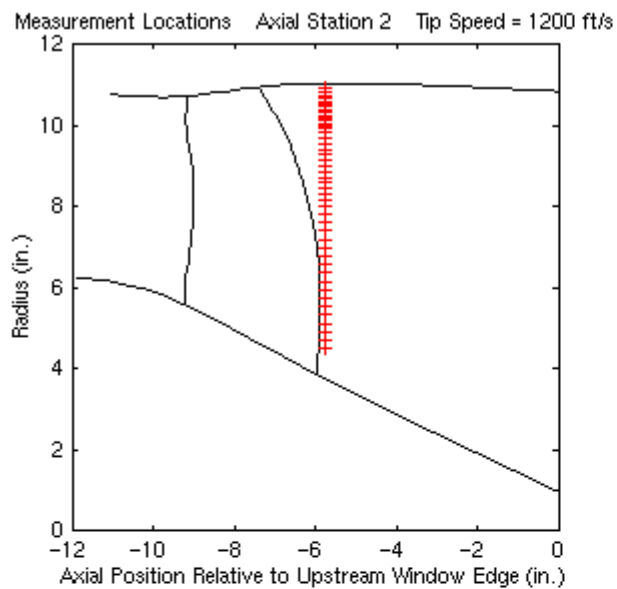
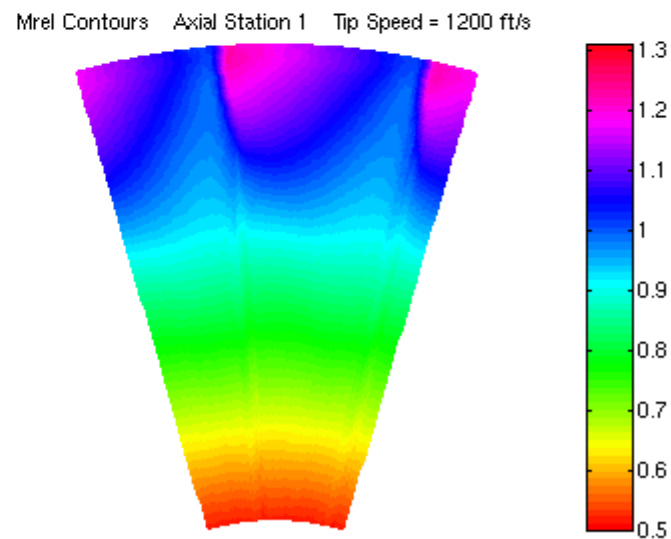
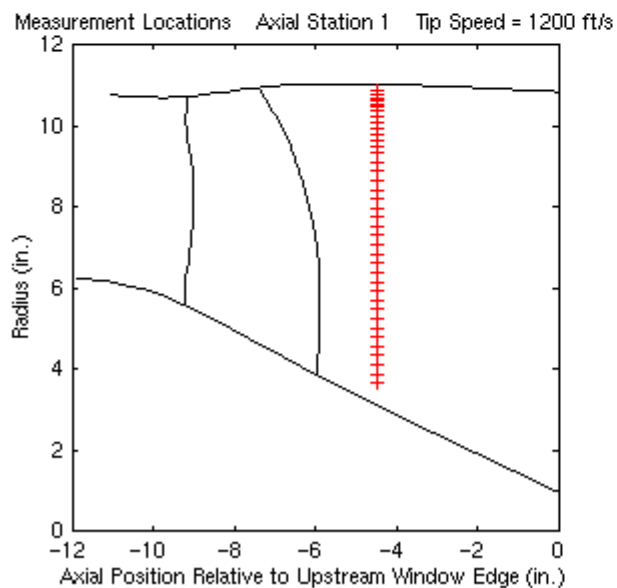
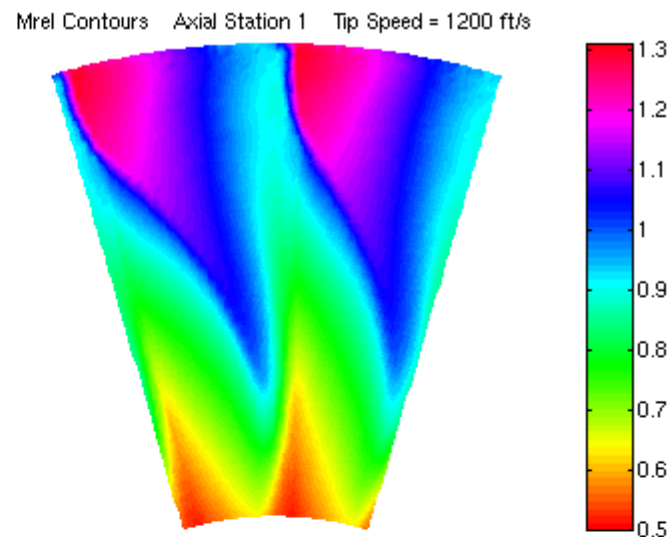
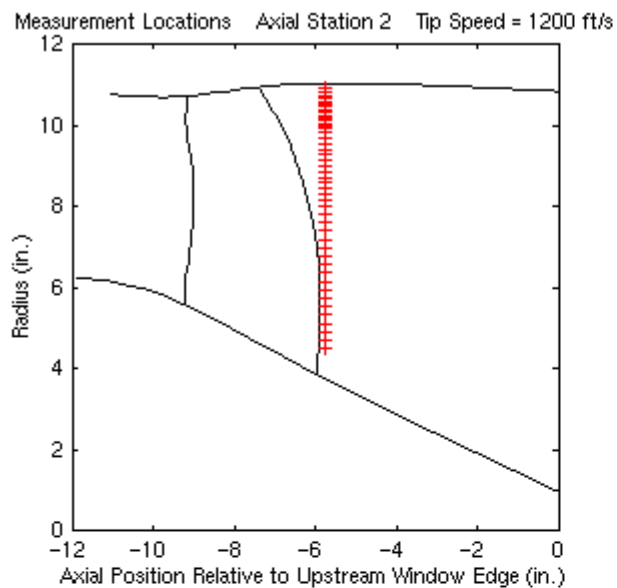


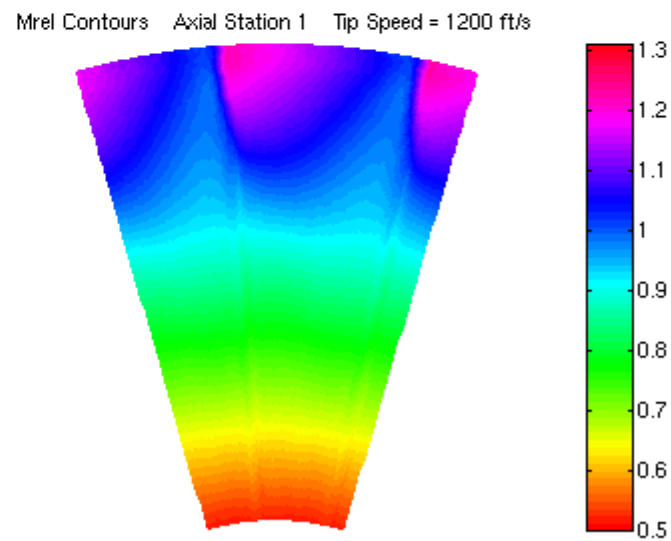
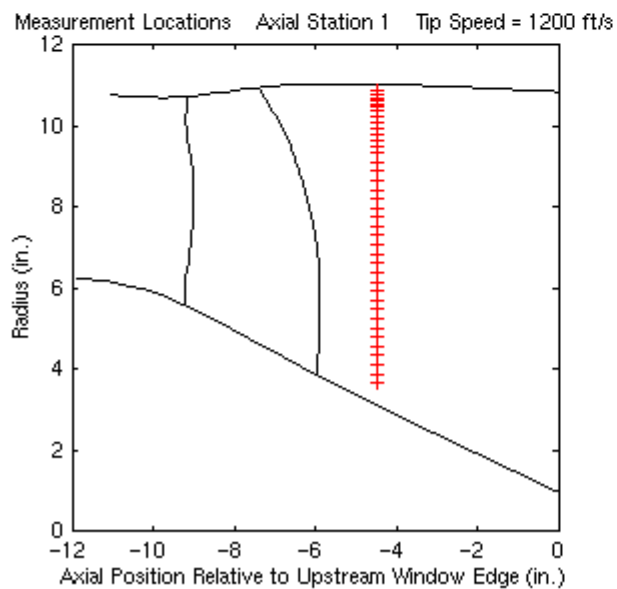
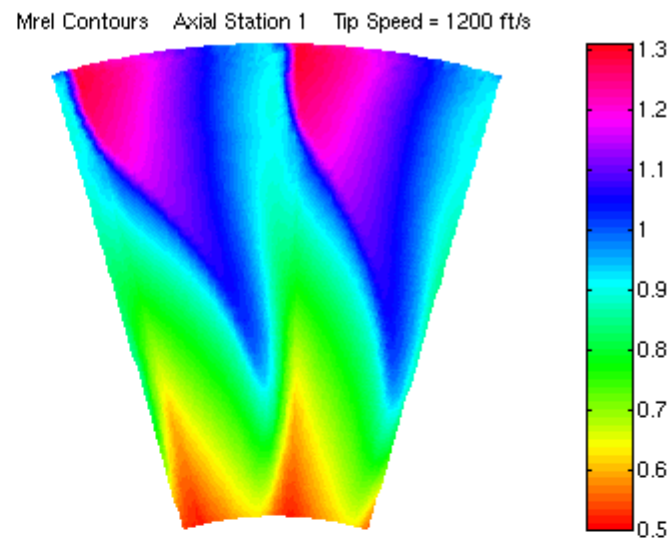
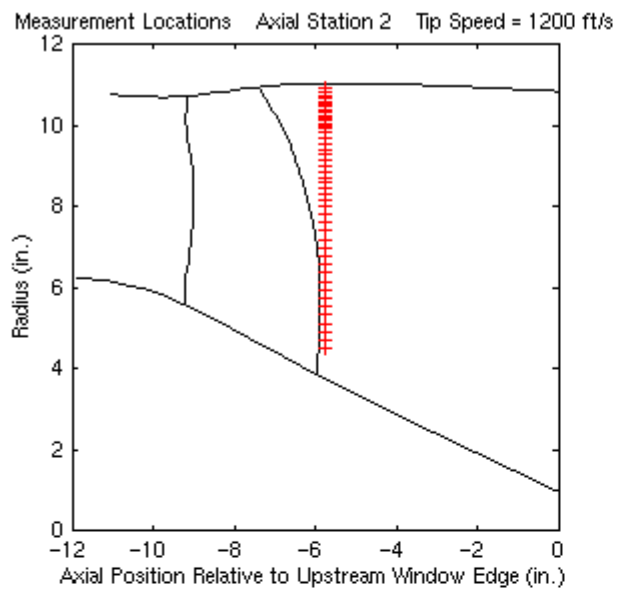
Figure 25. —Slideshow (22 slides) illustrating the blade-to-blade variations in the flow measured upstream of the aft-swept fan at axial stations 1 and 2 at the mid-speed operating condition.

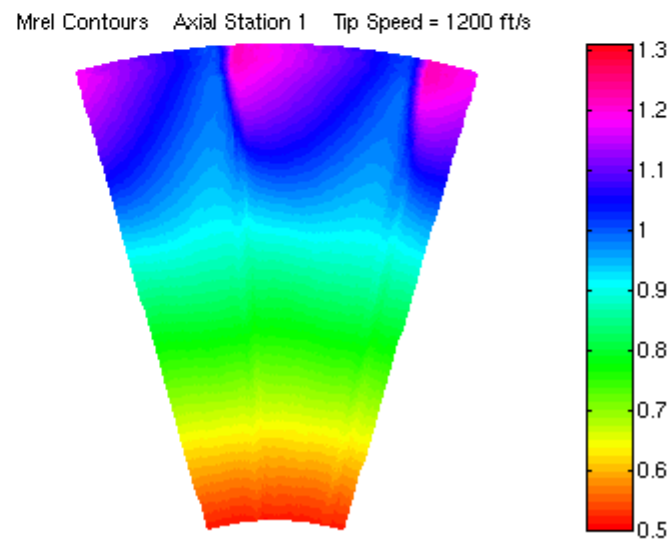
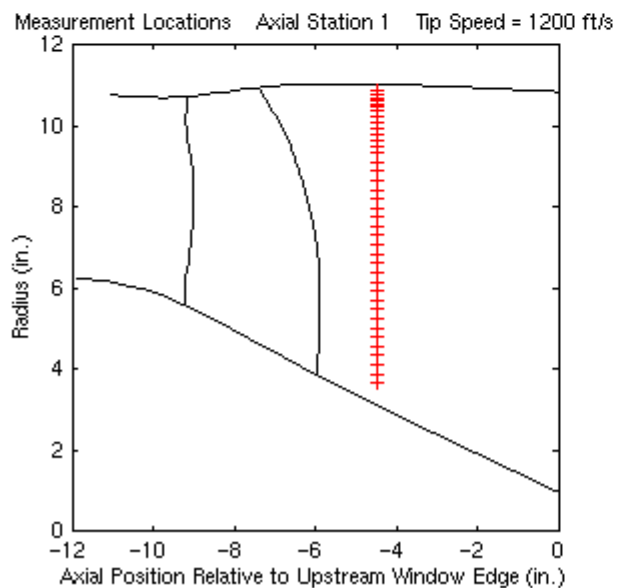
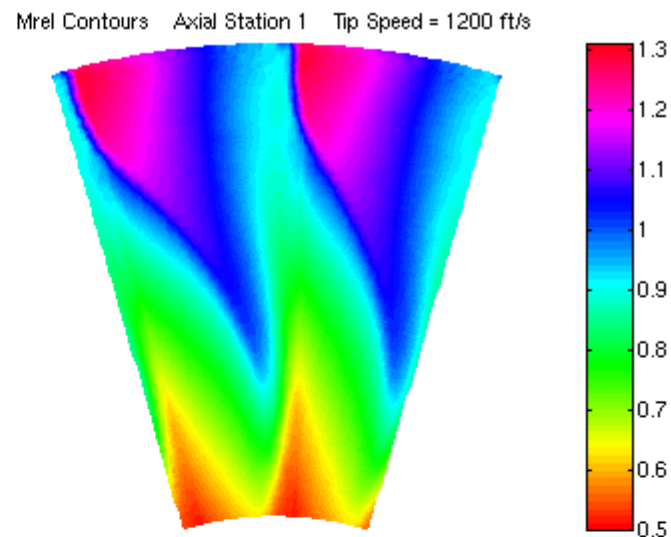
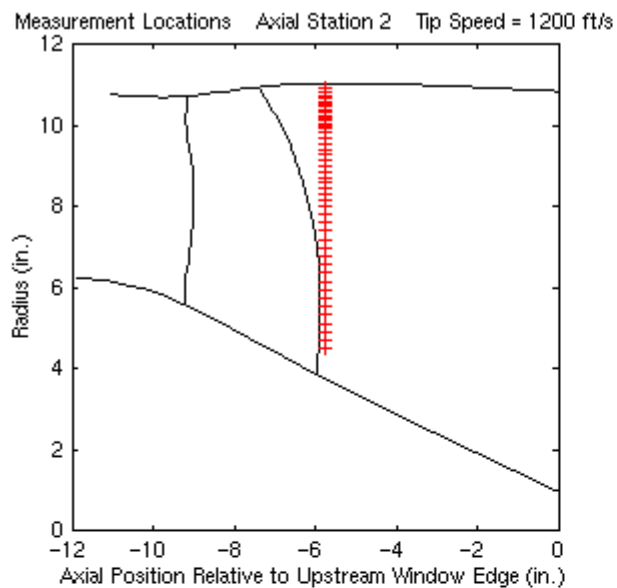


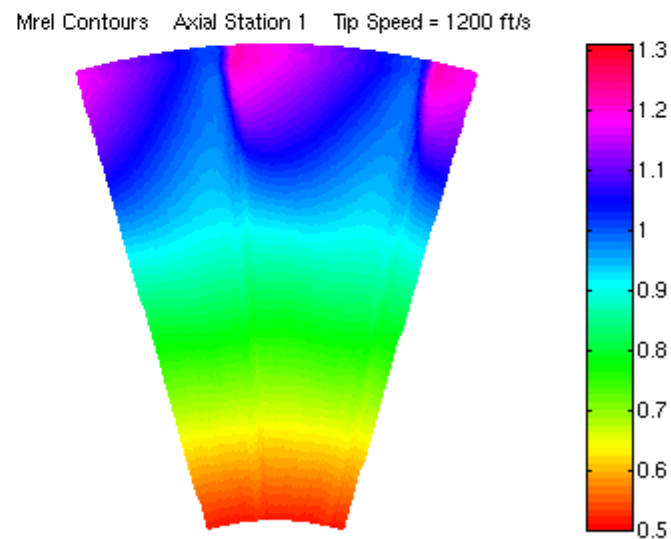
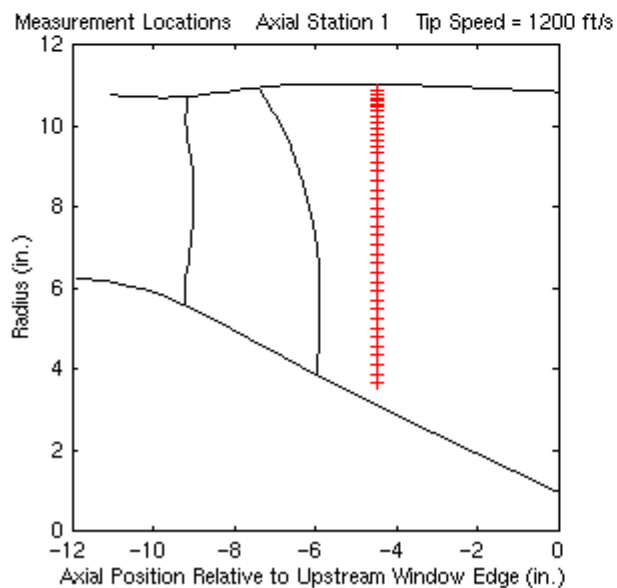
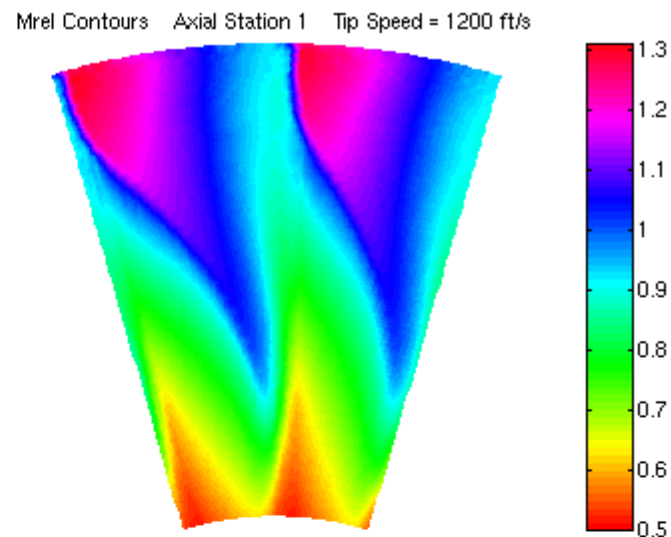
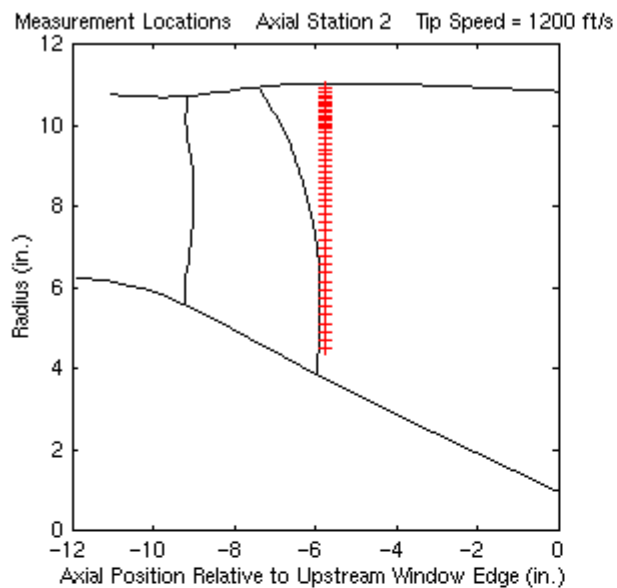


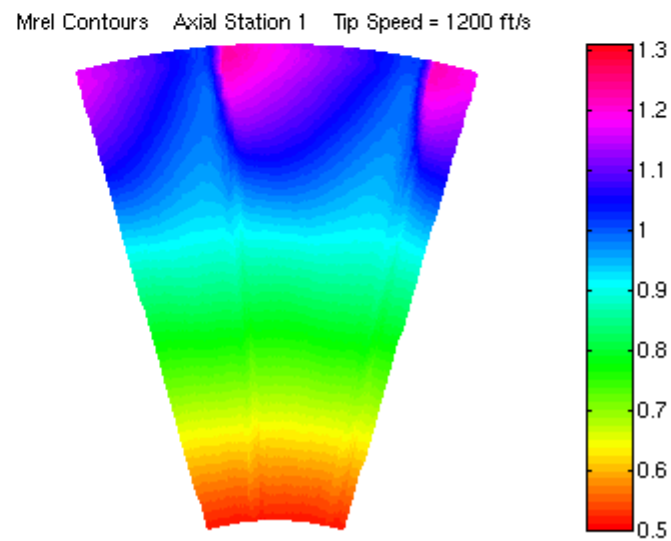
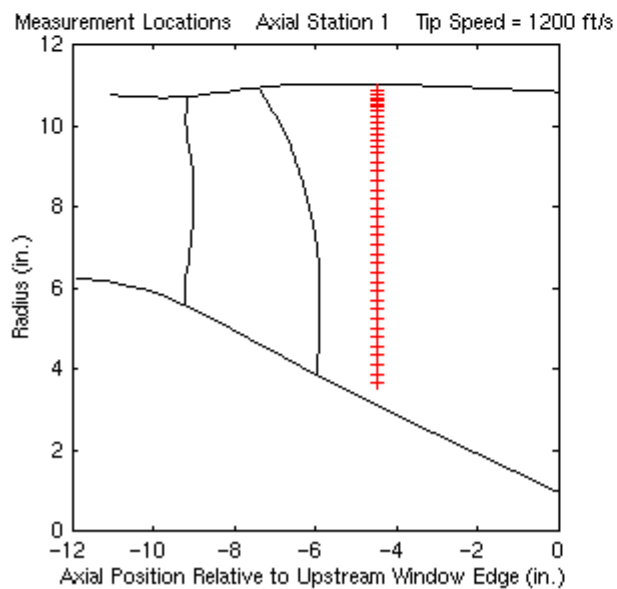
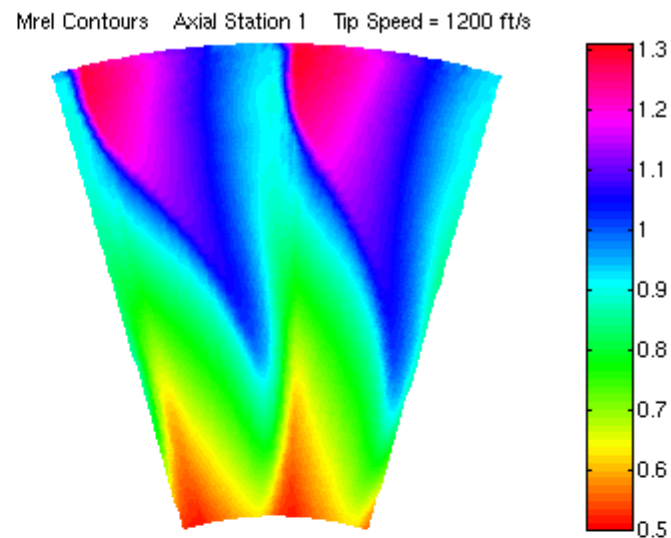
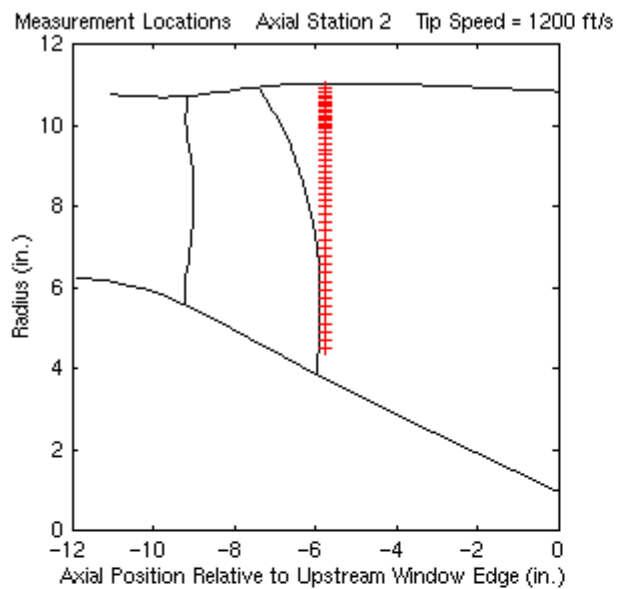


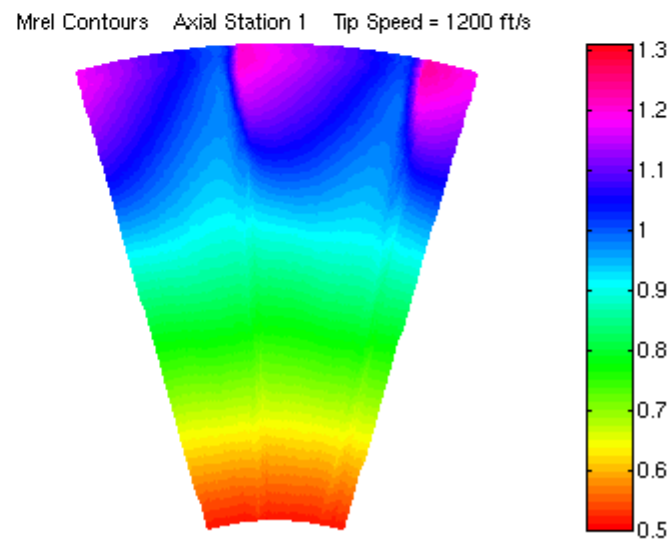
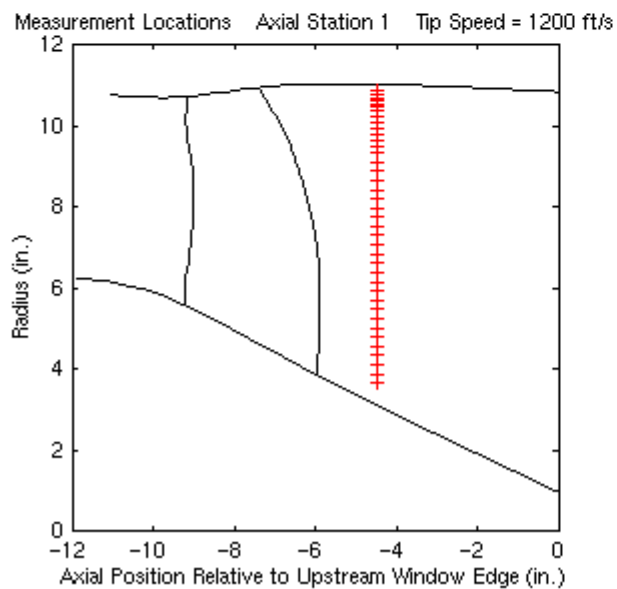
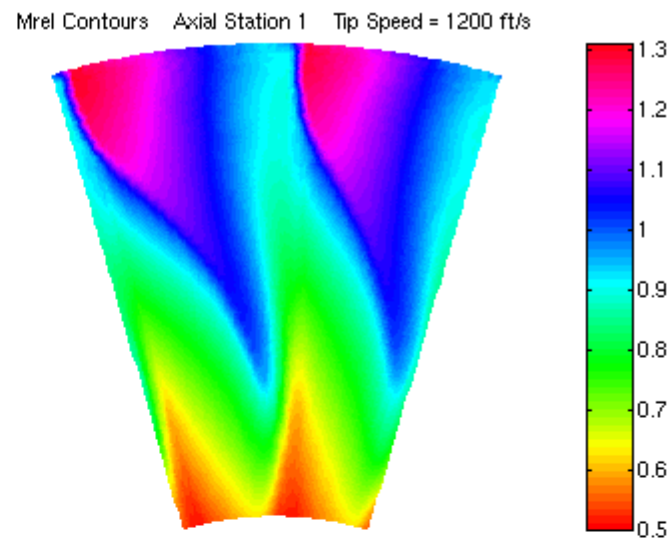
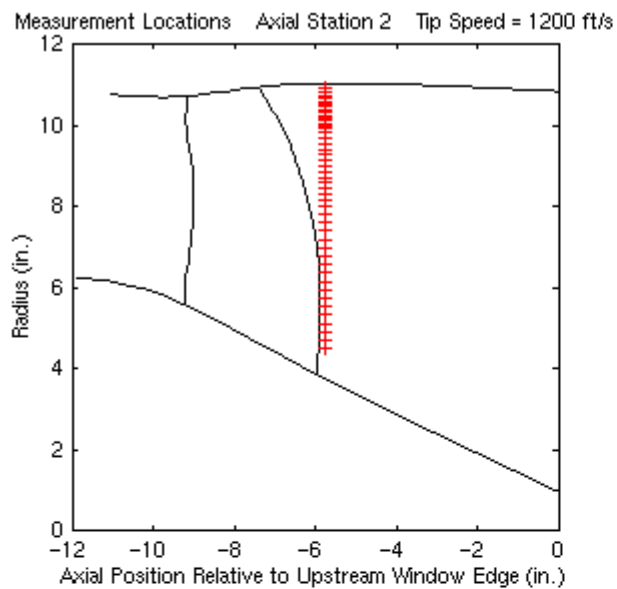


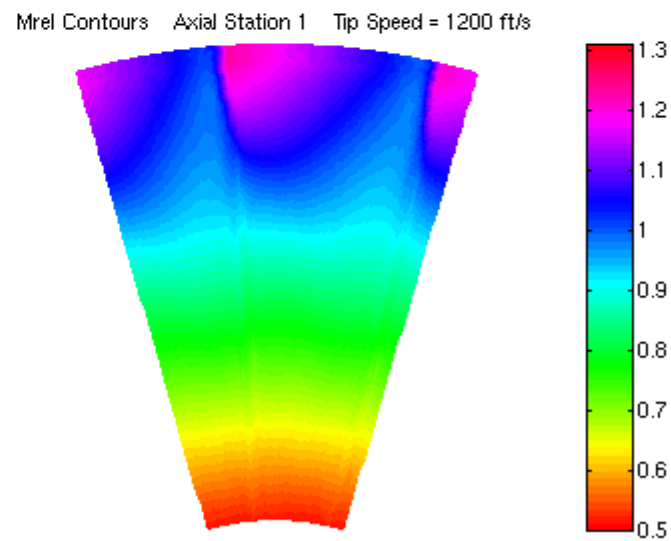
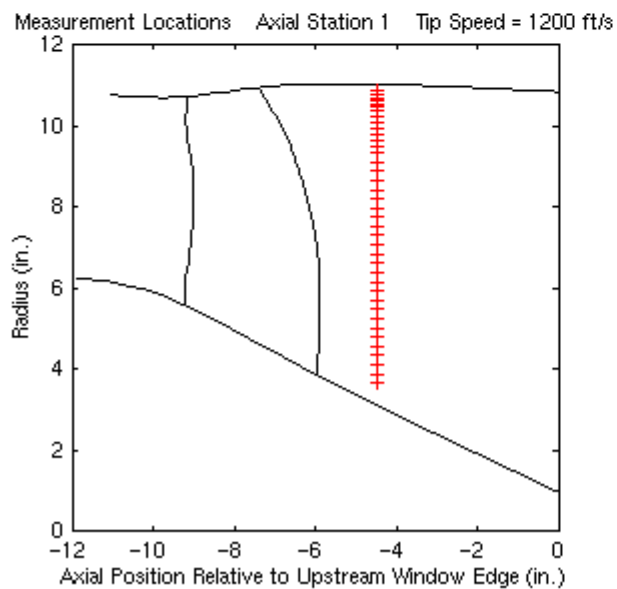
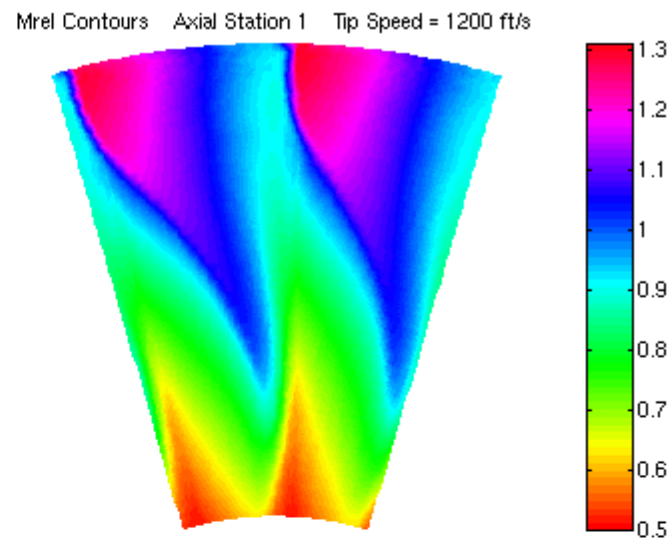
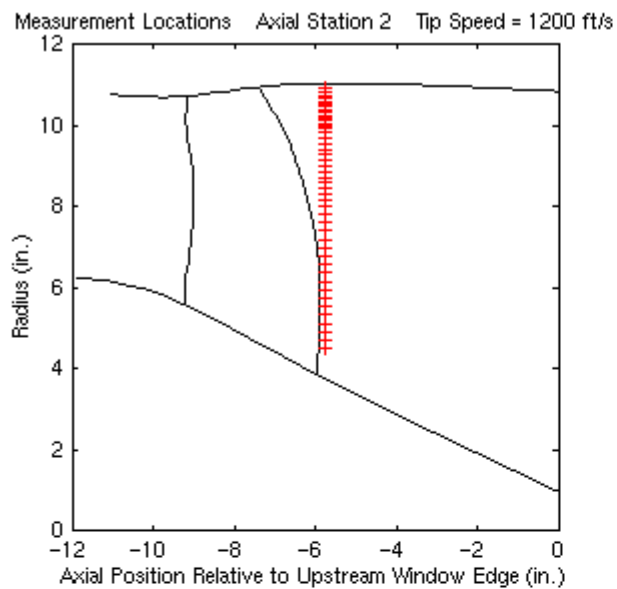


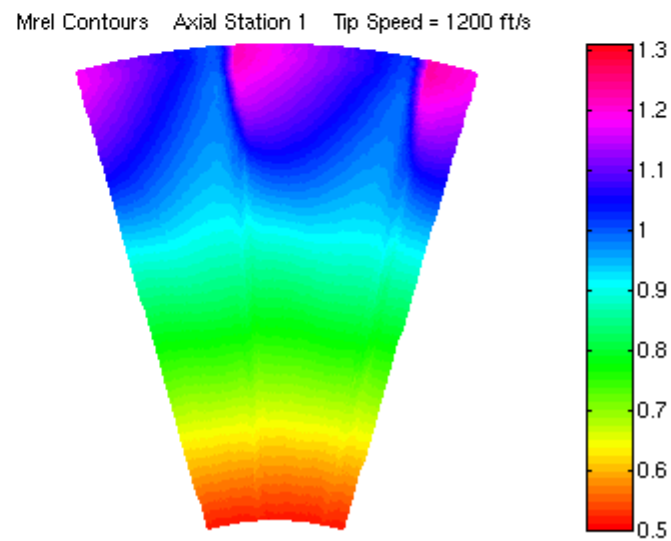
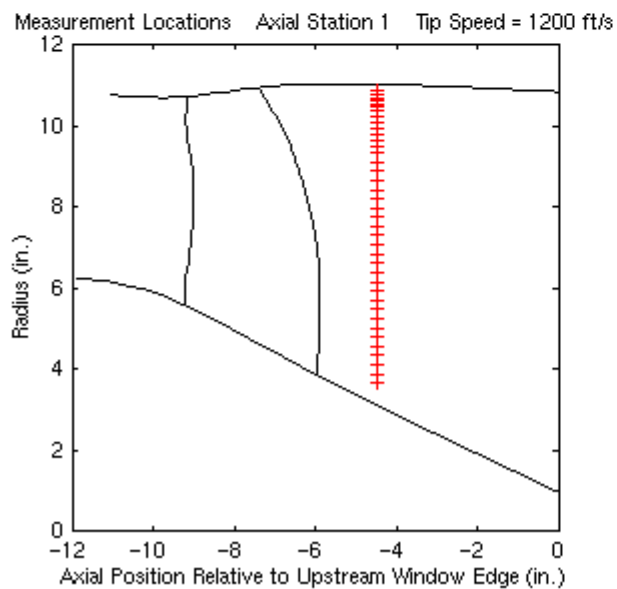
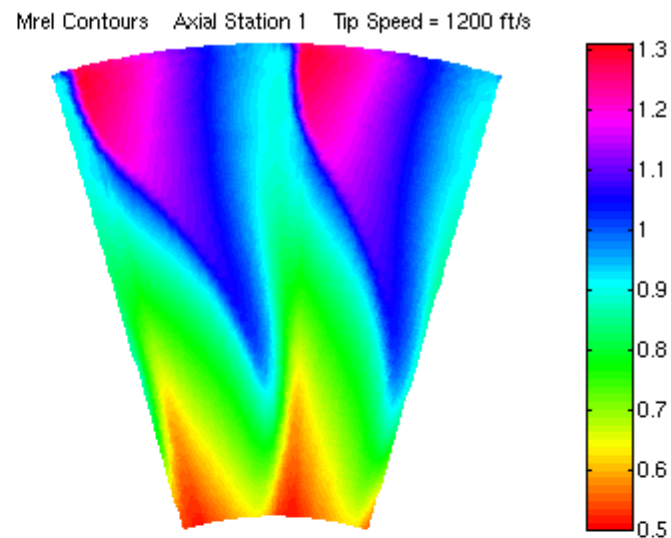
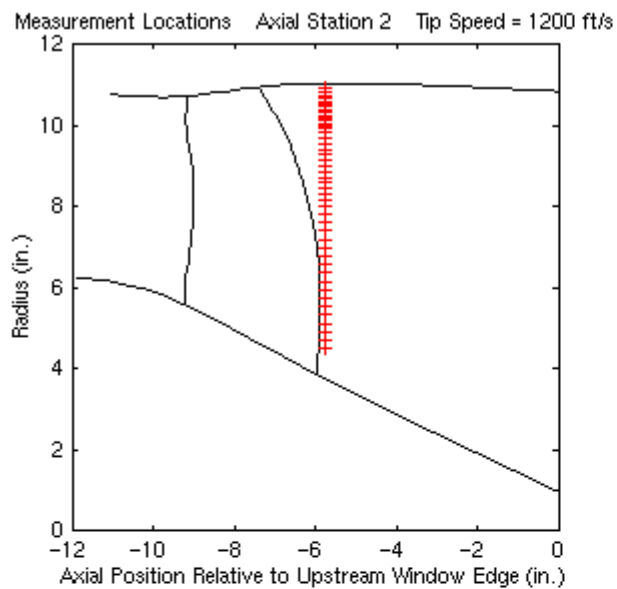


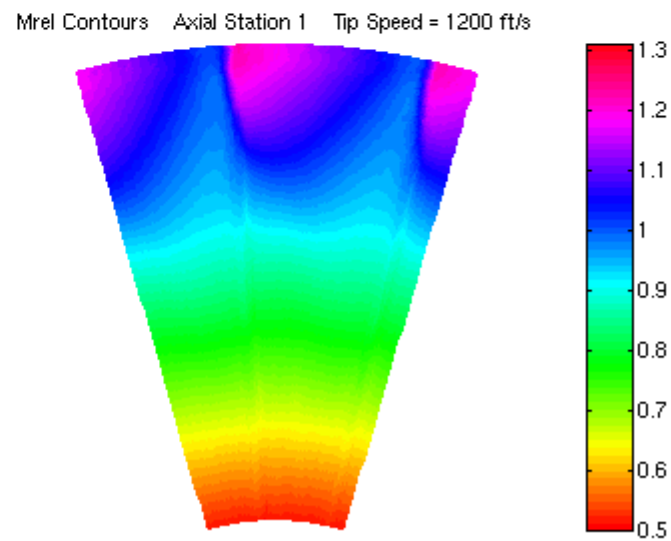
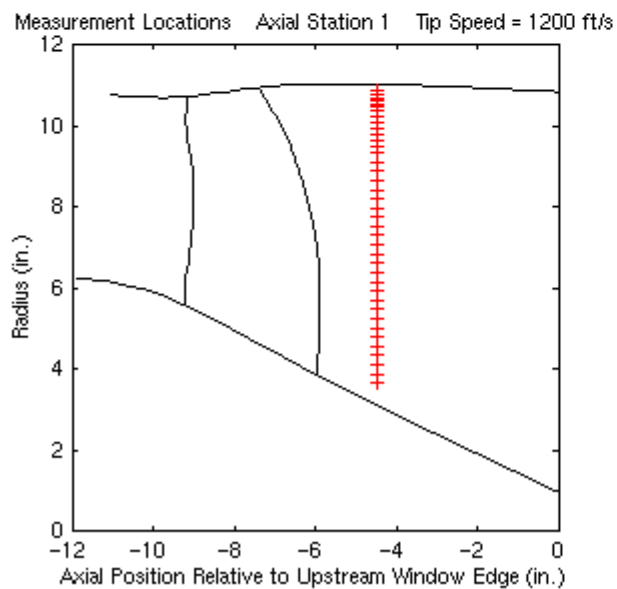
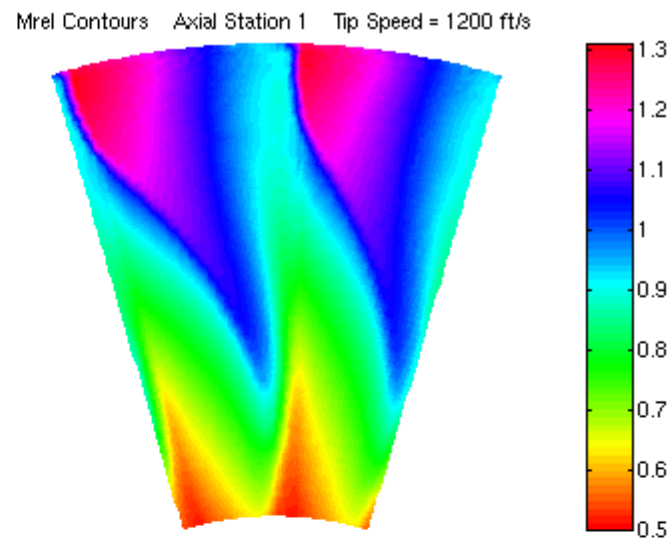
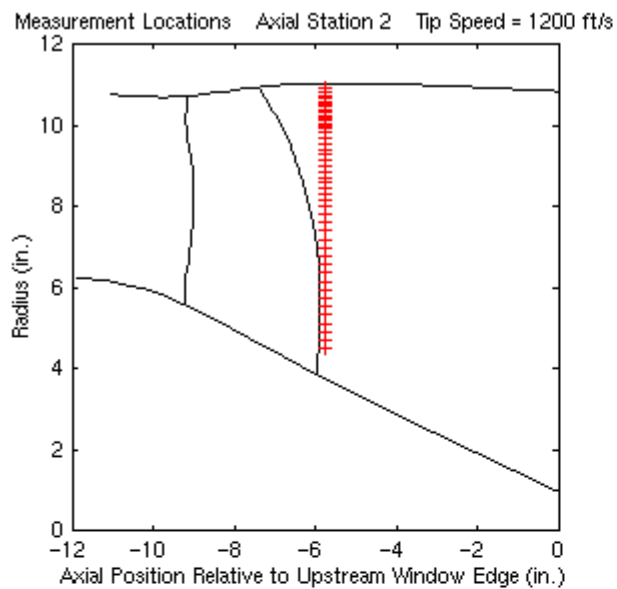


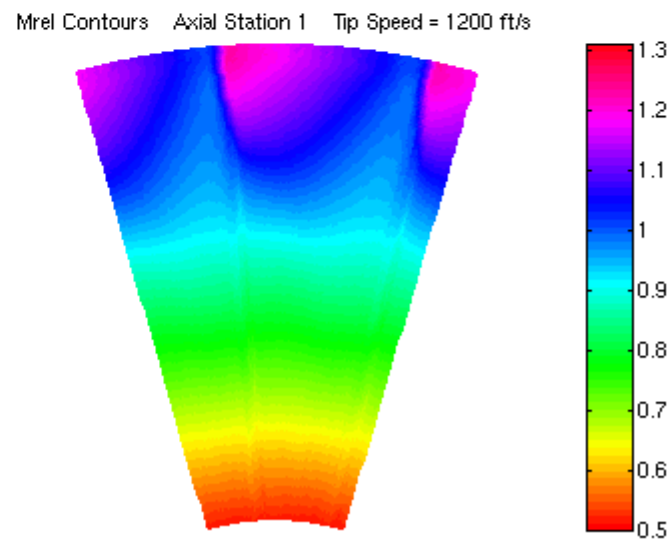
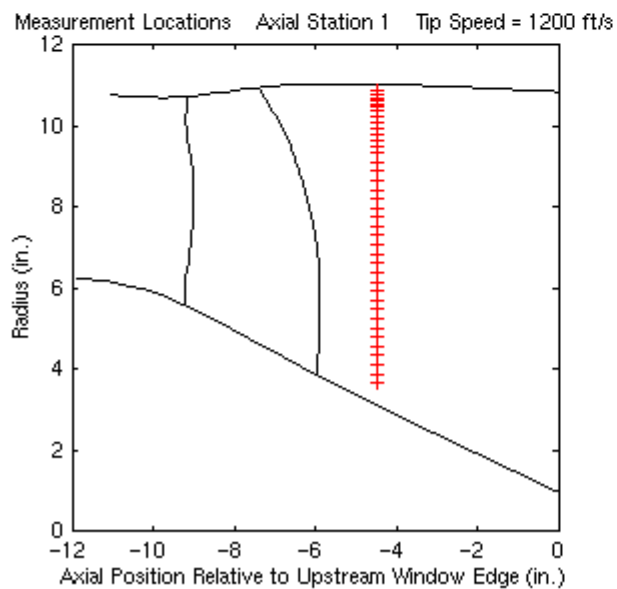
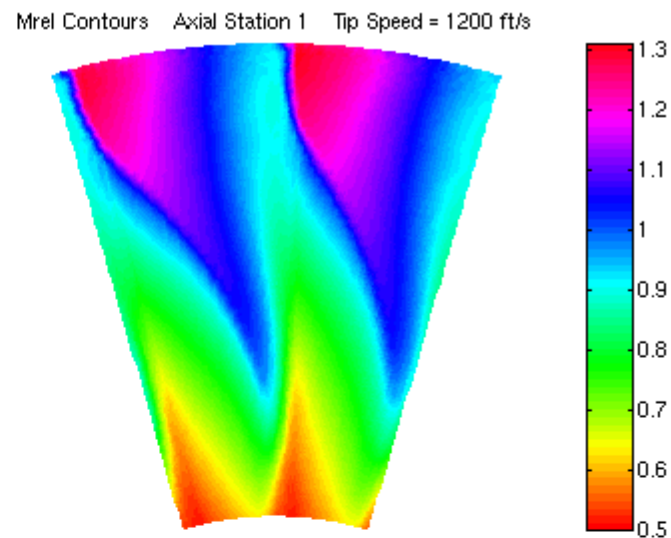
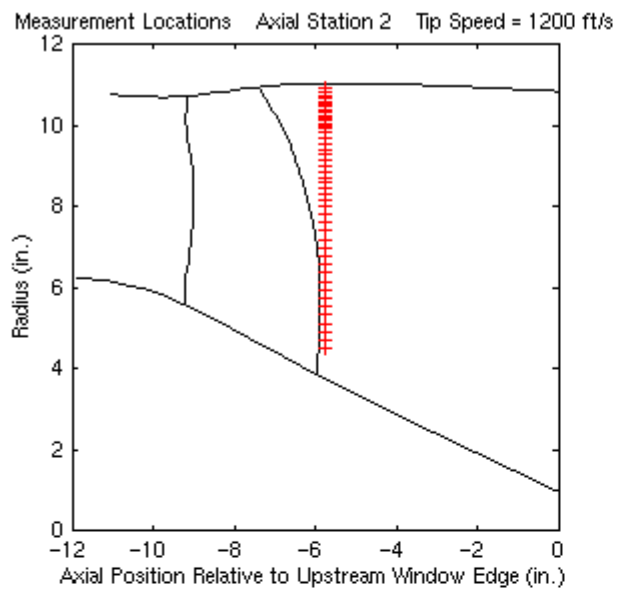


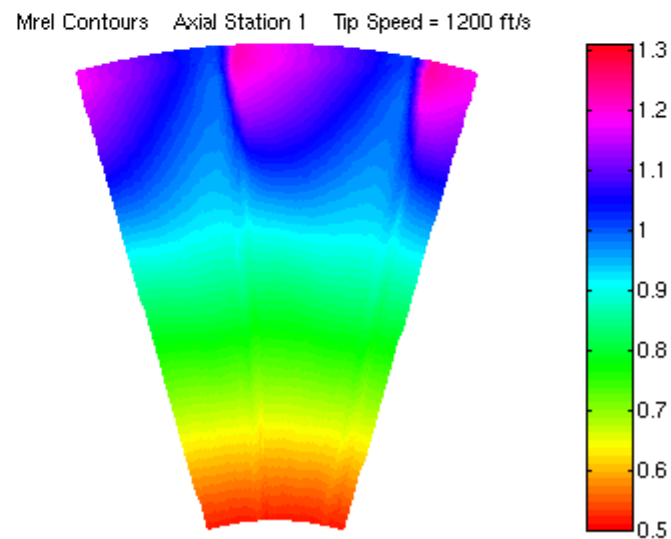
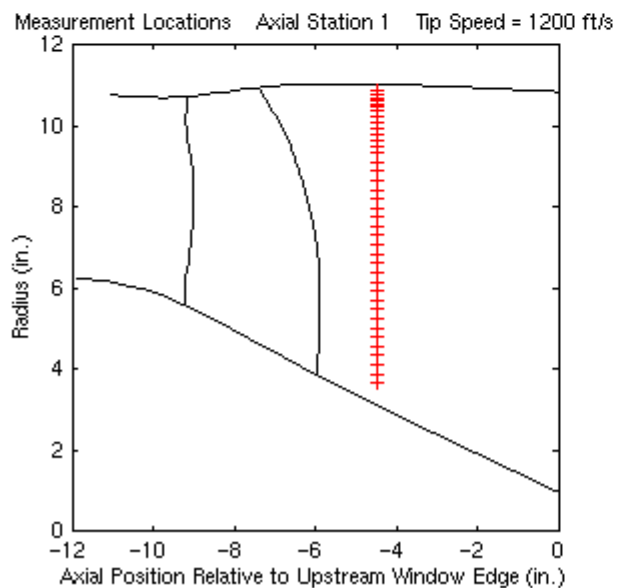
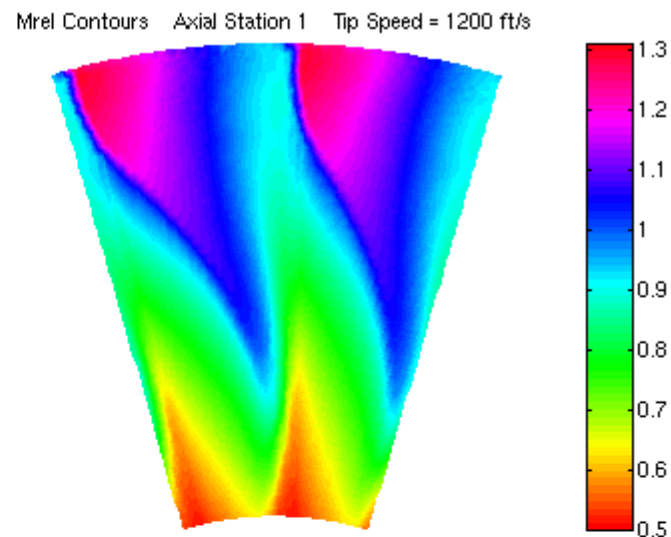
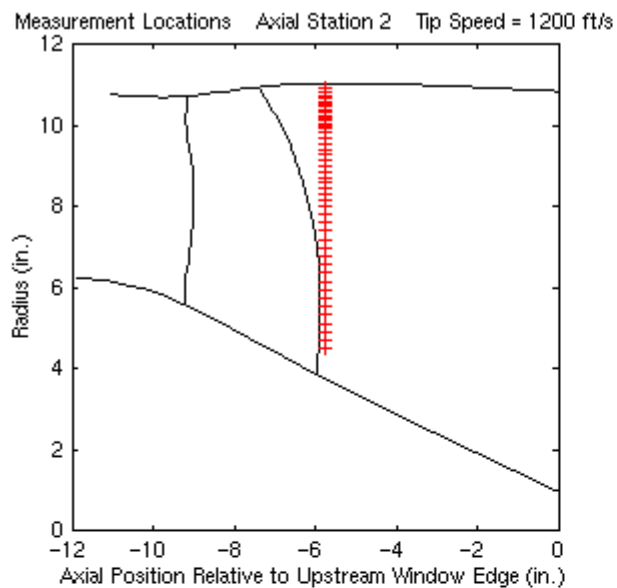


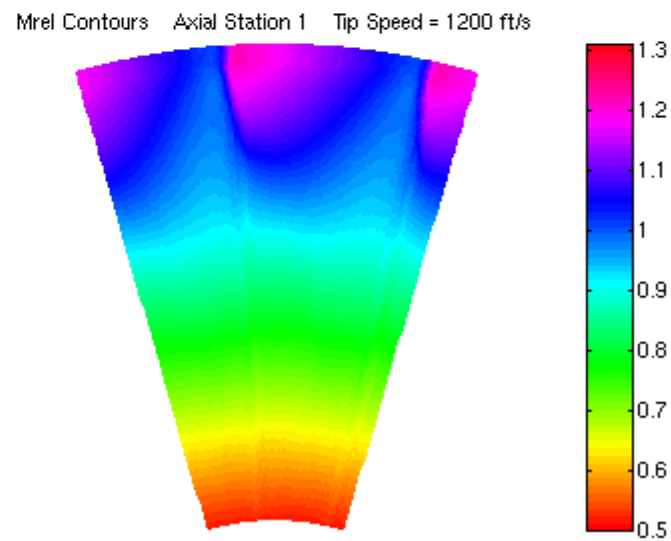
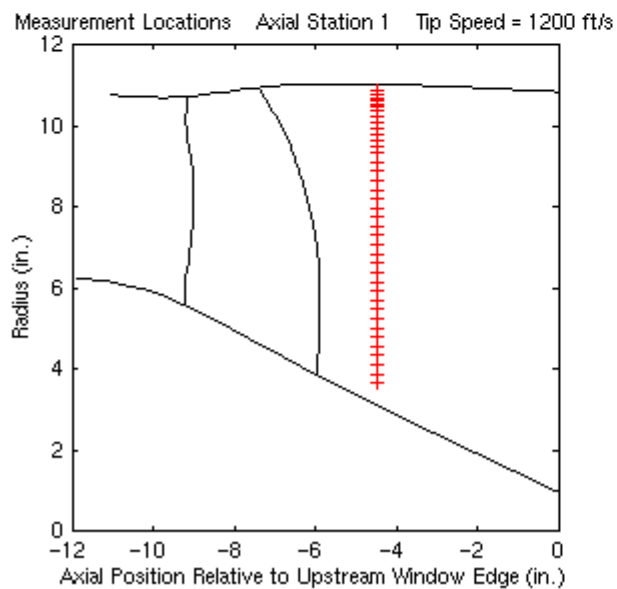
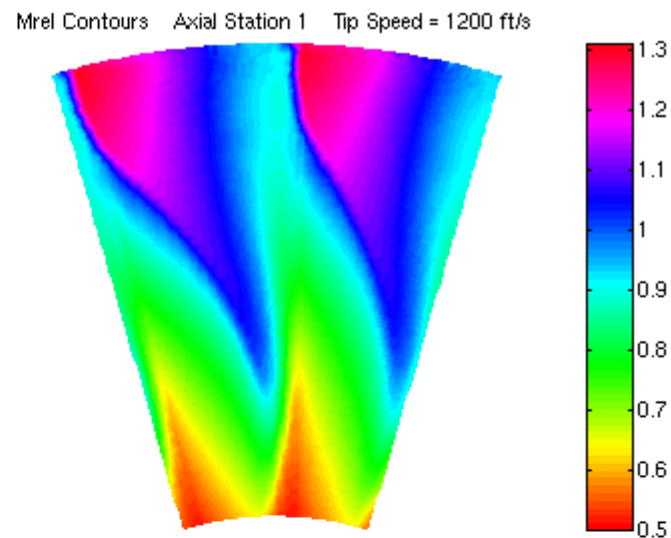
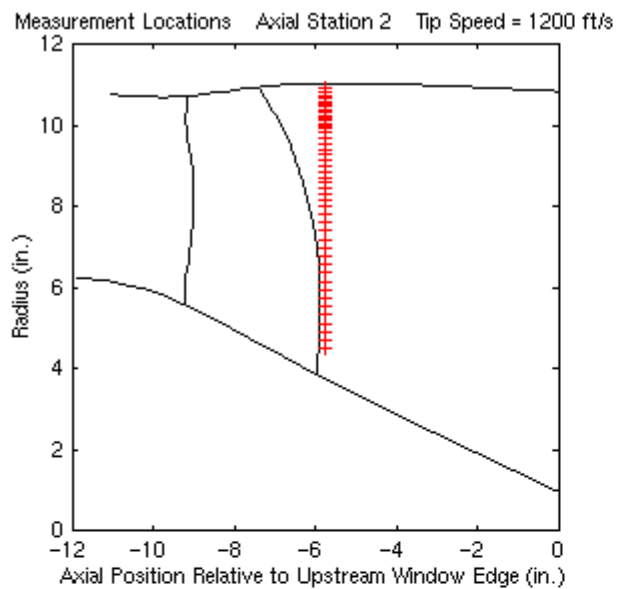


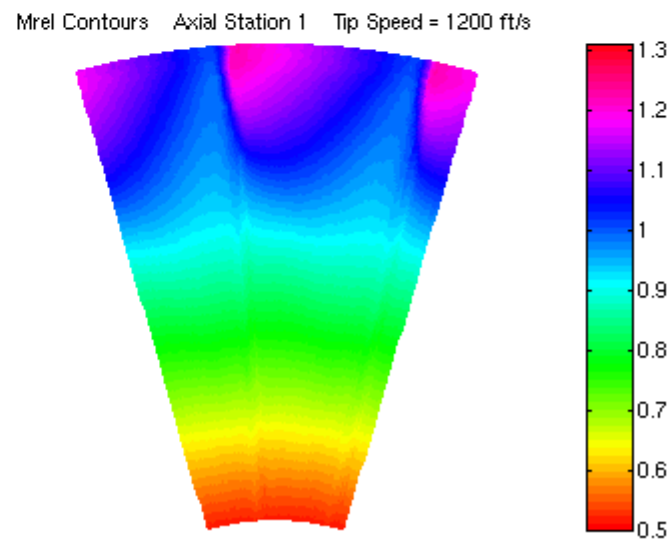
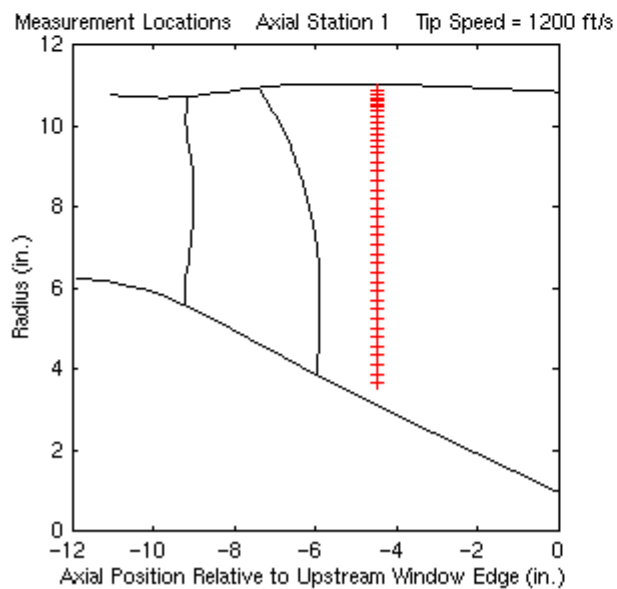
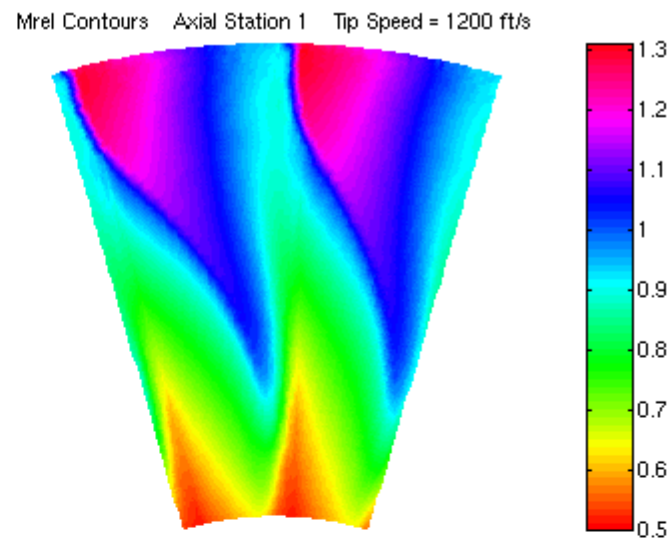
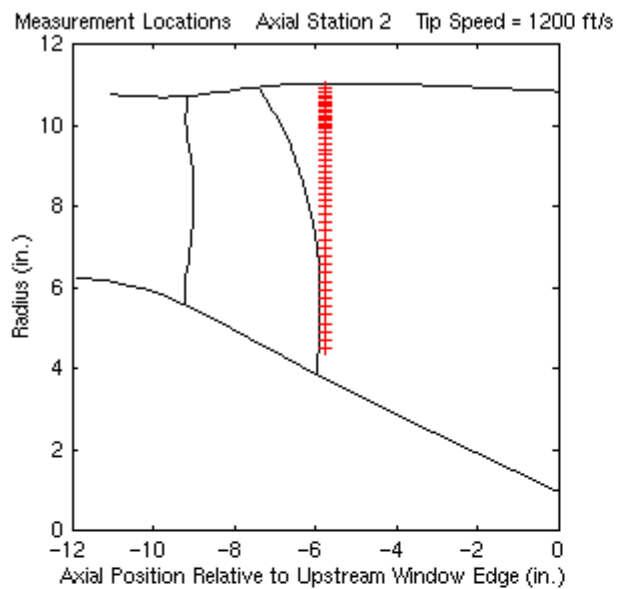


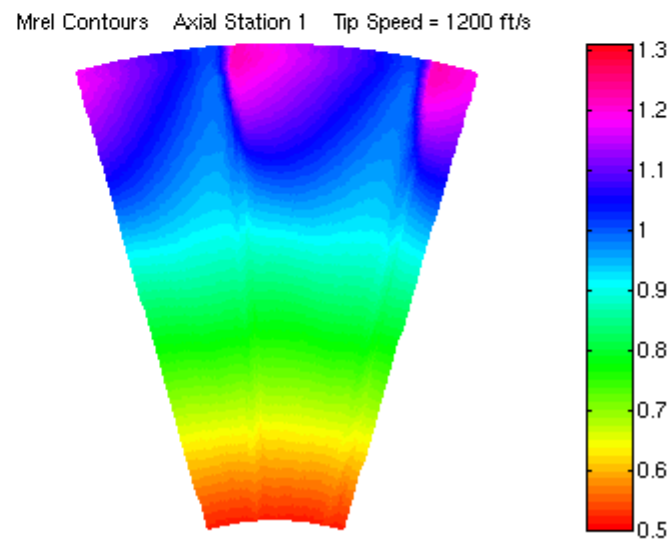
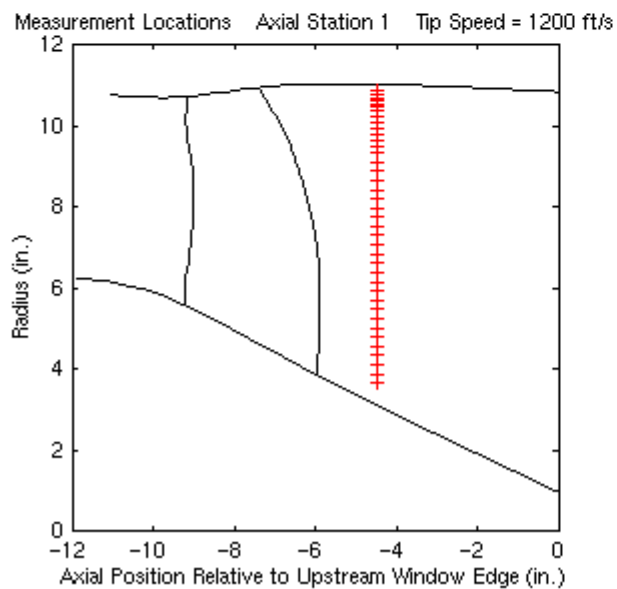
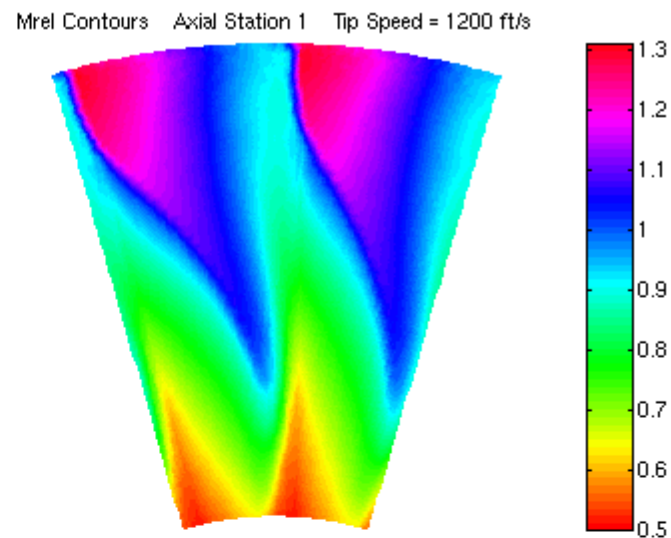
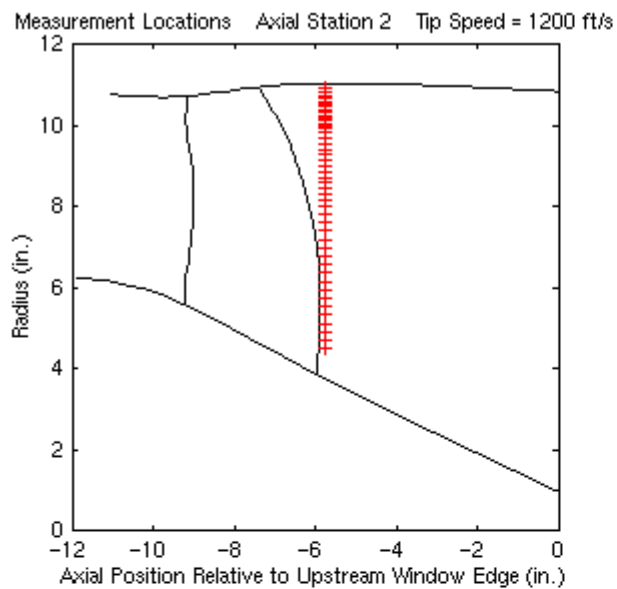


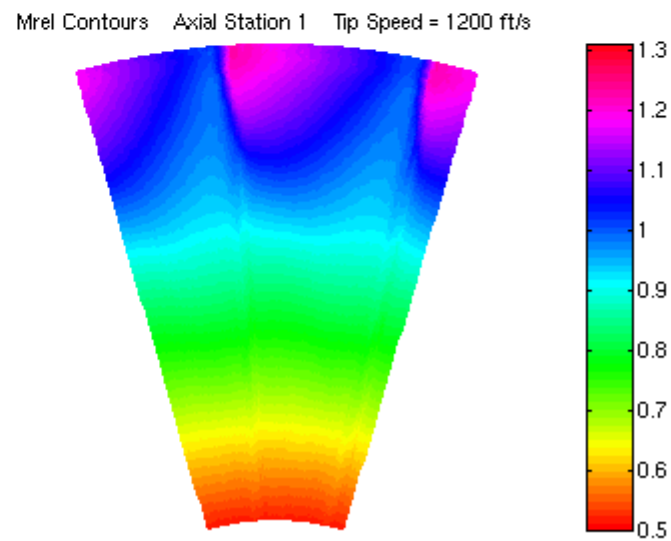
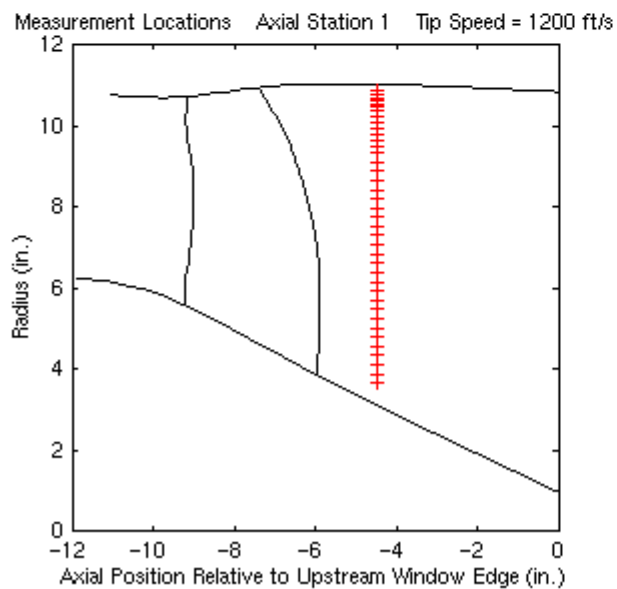
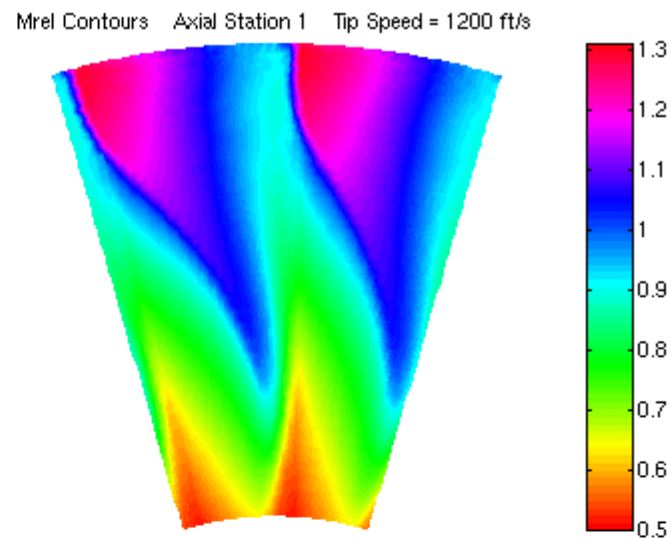
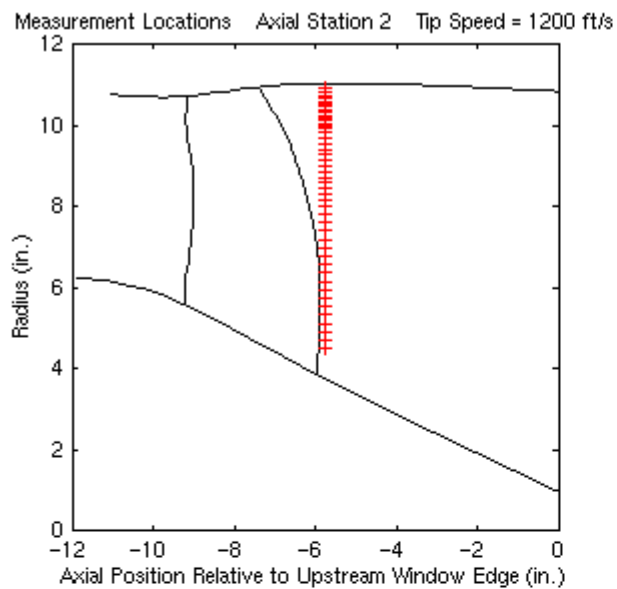


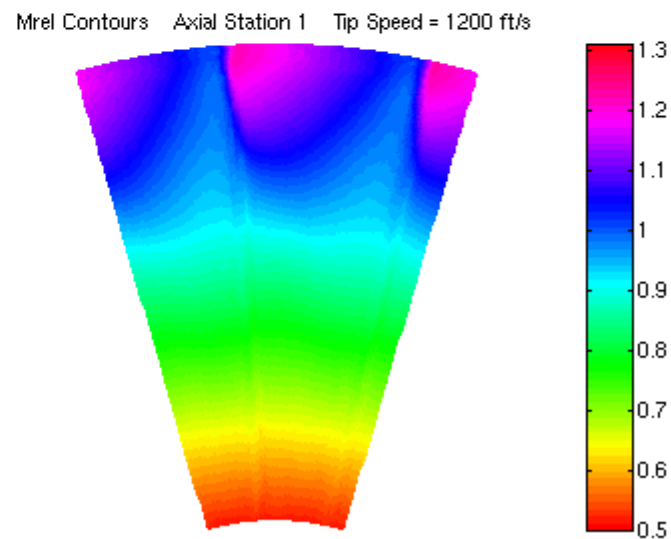
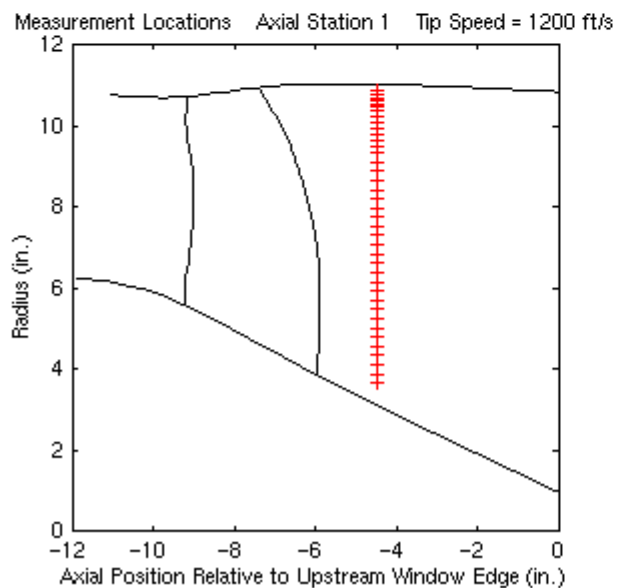
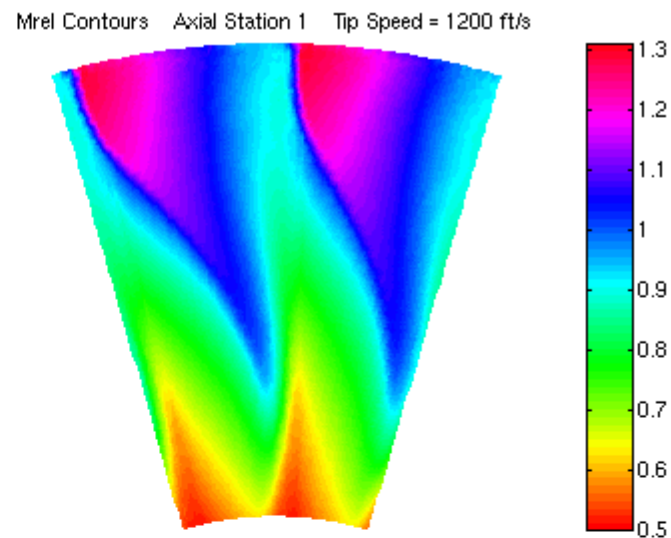
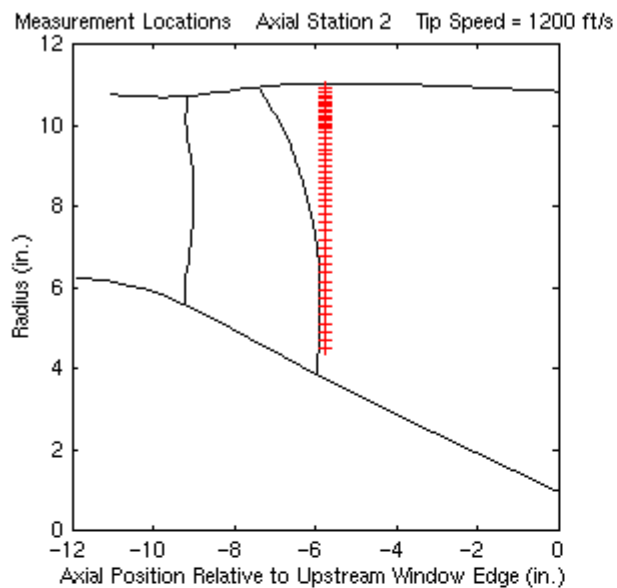


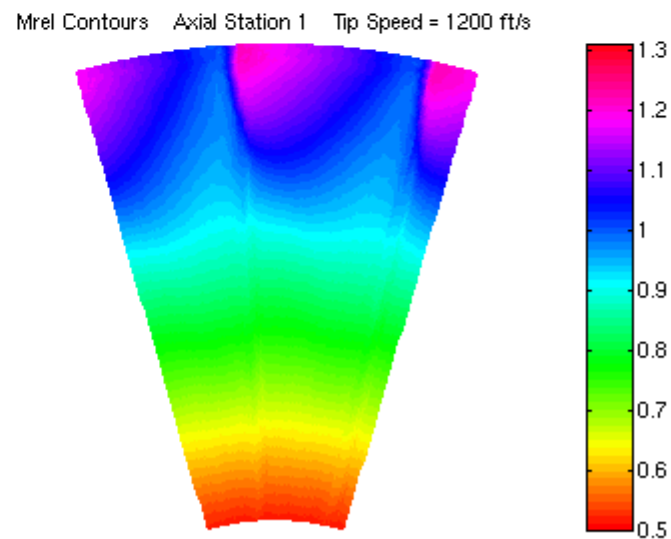
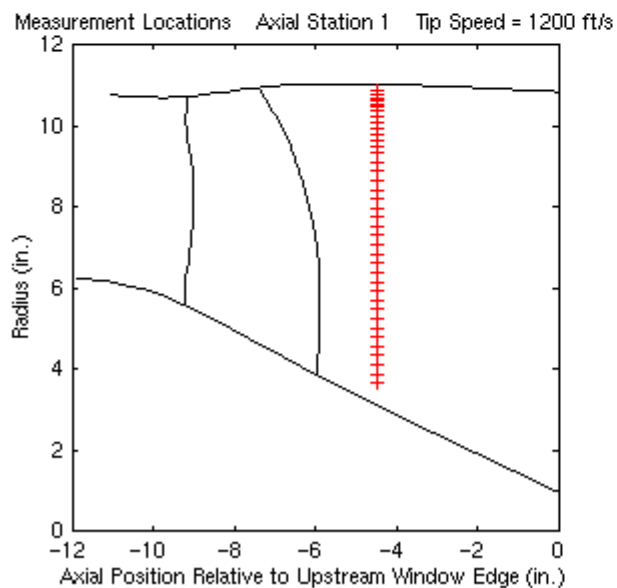
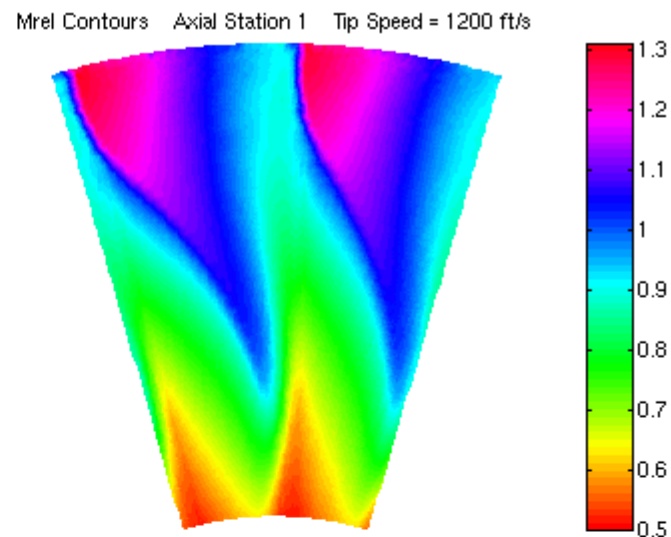
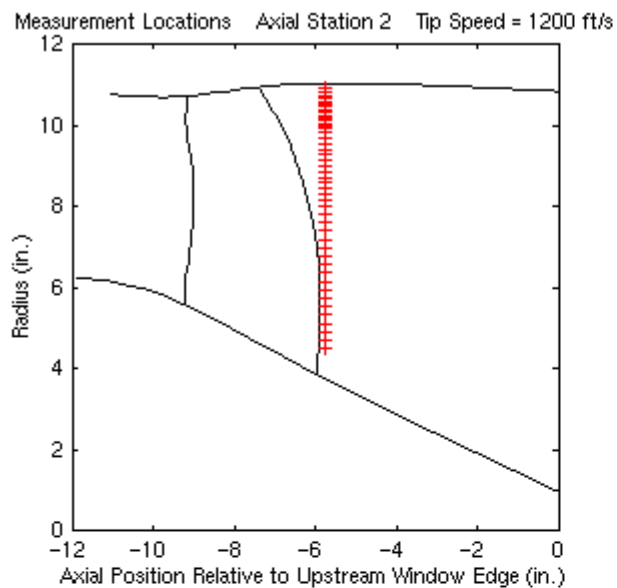


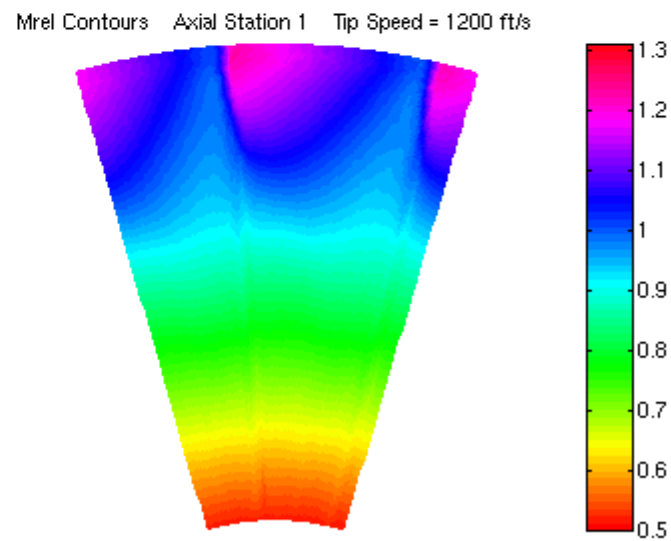
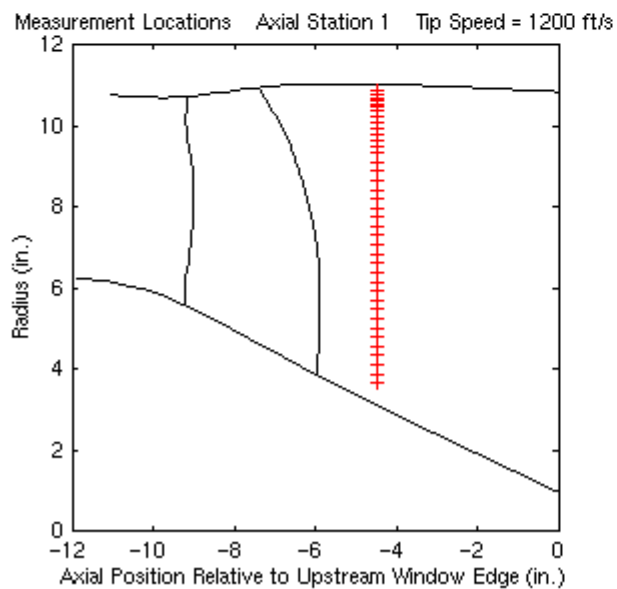
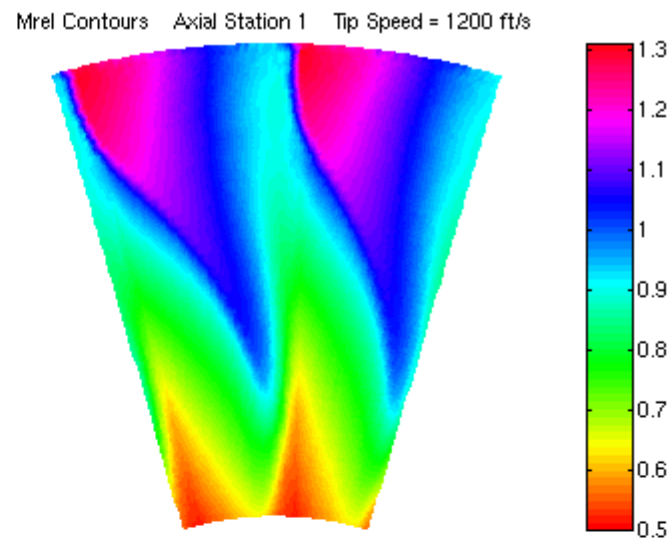
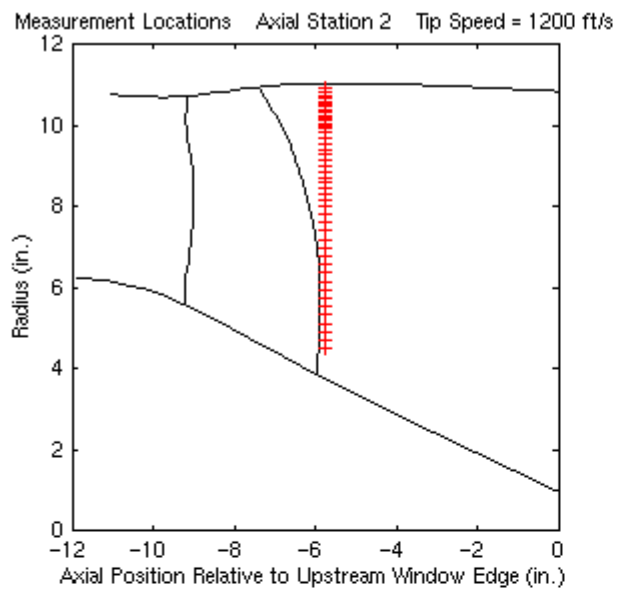












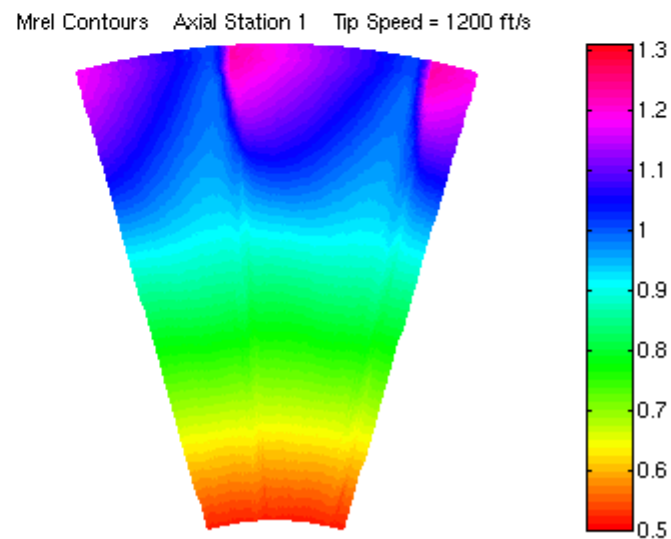
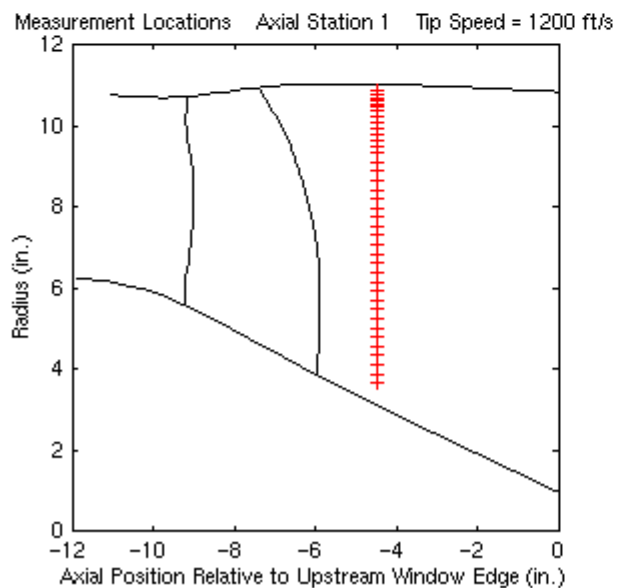
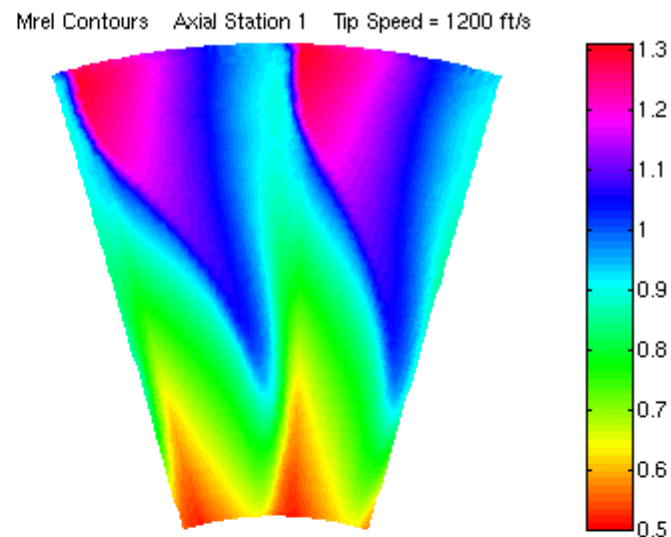
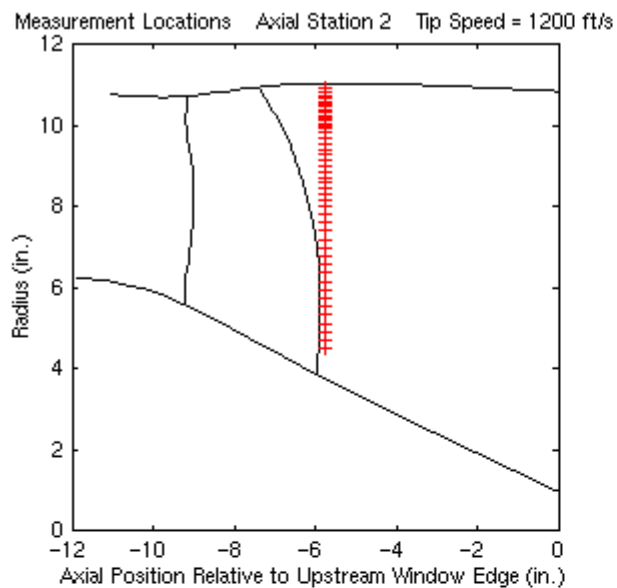
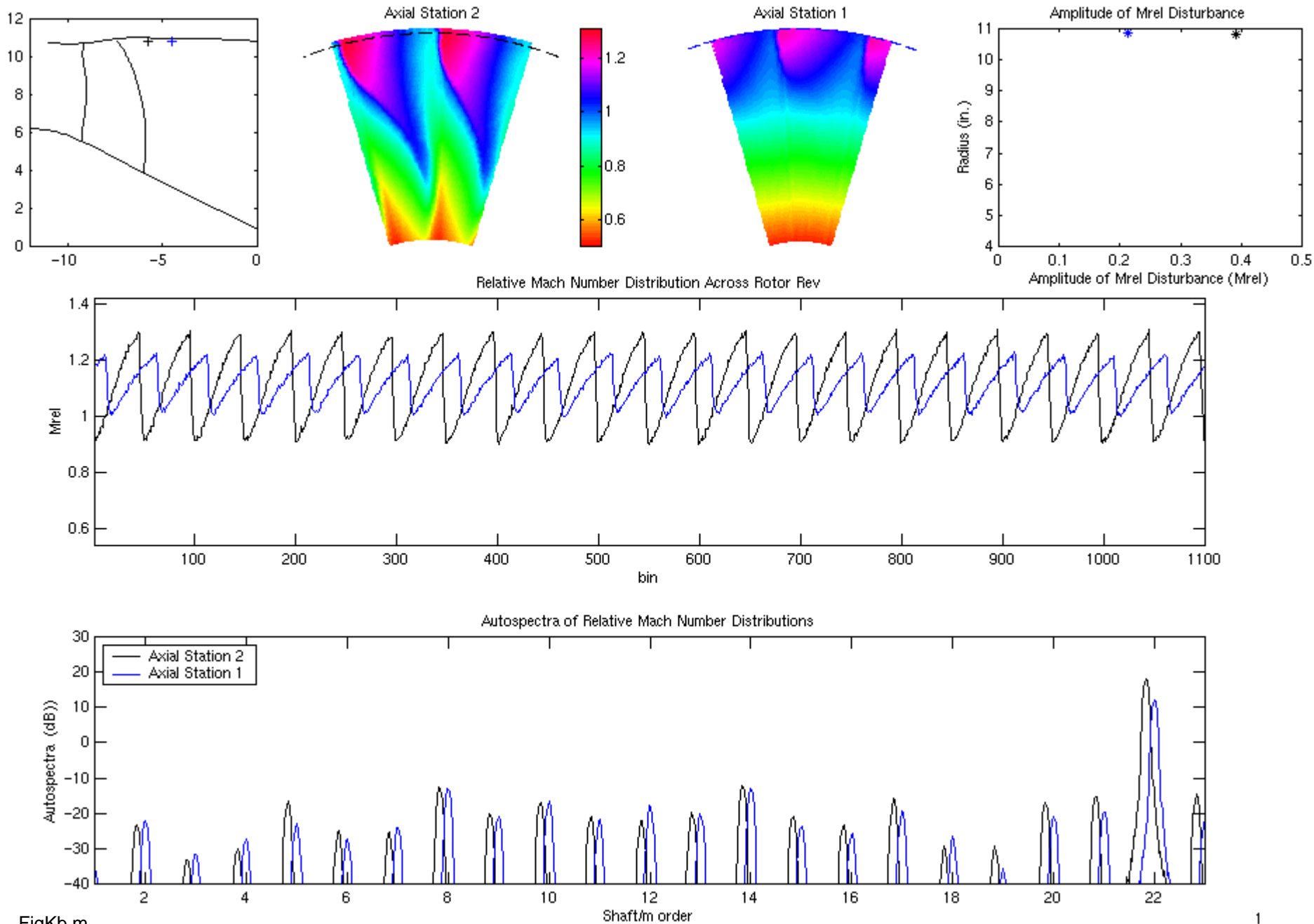
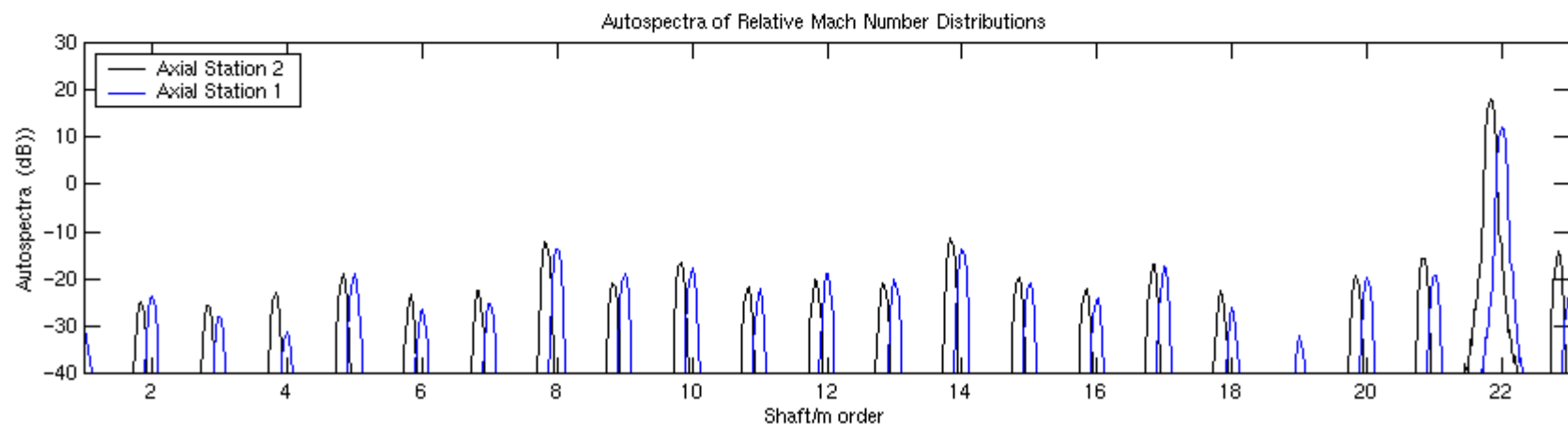
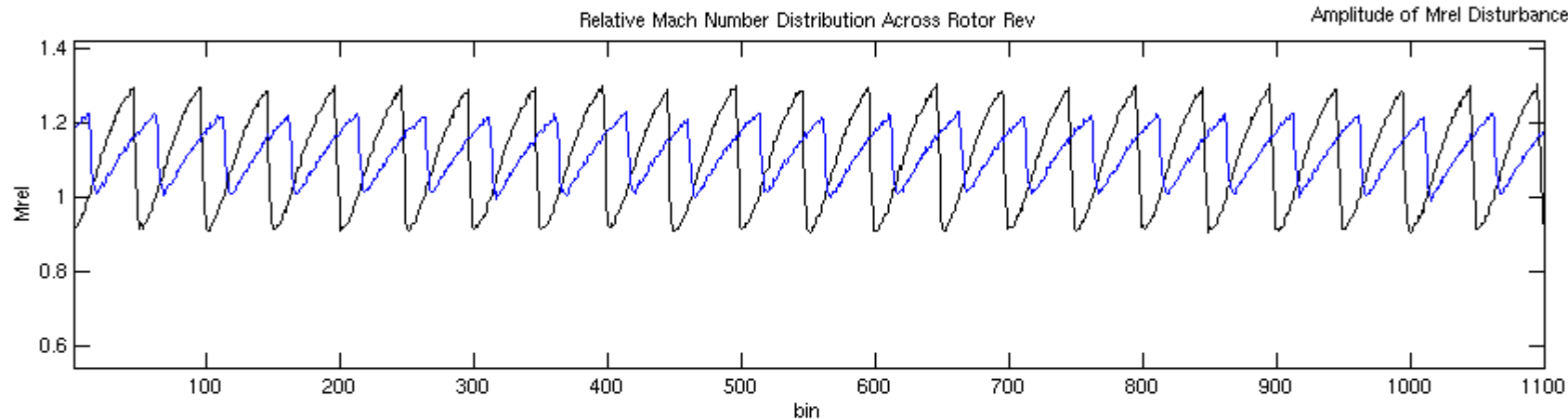
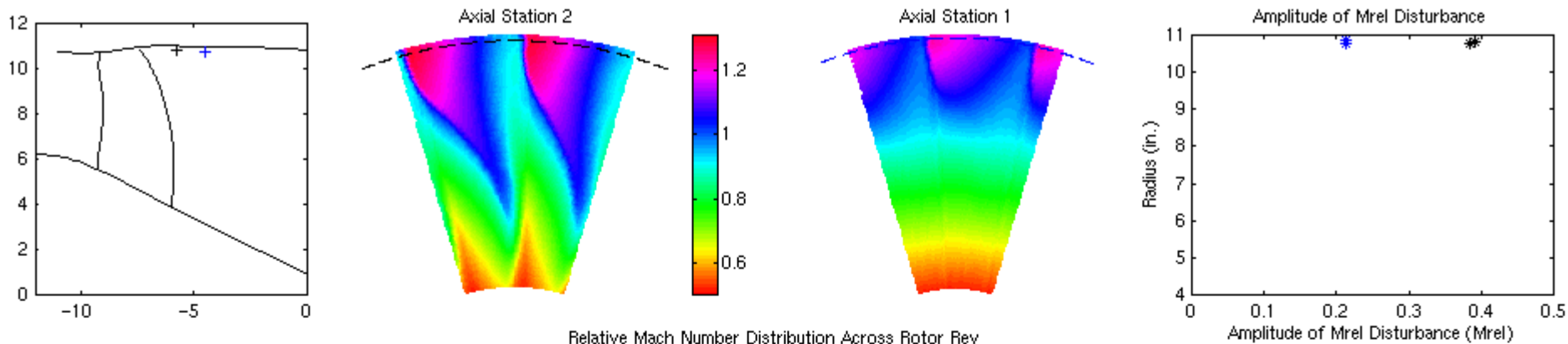
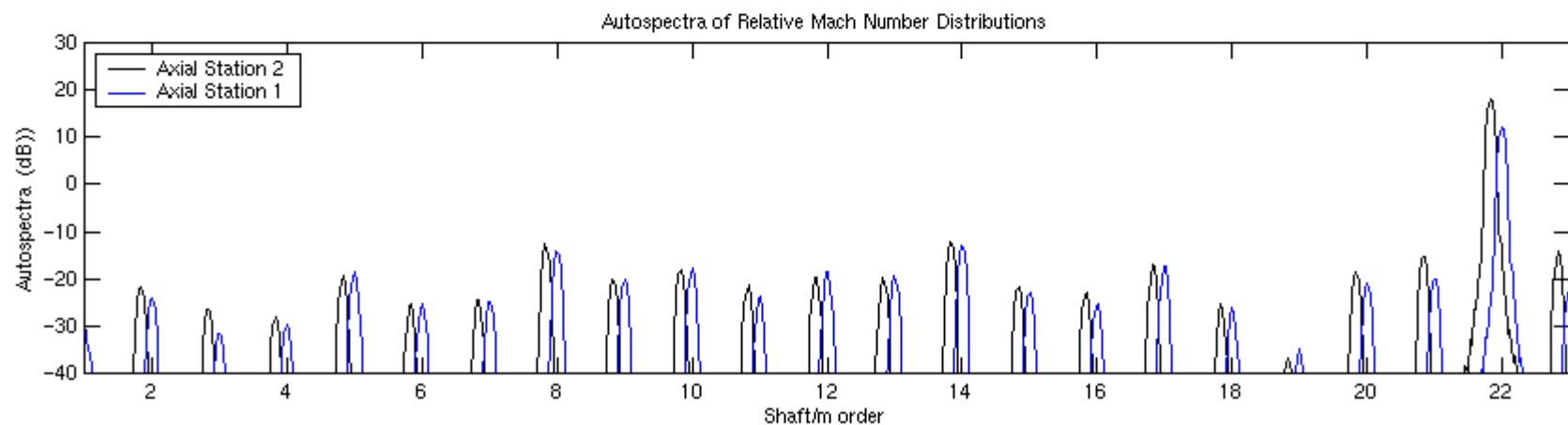
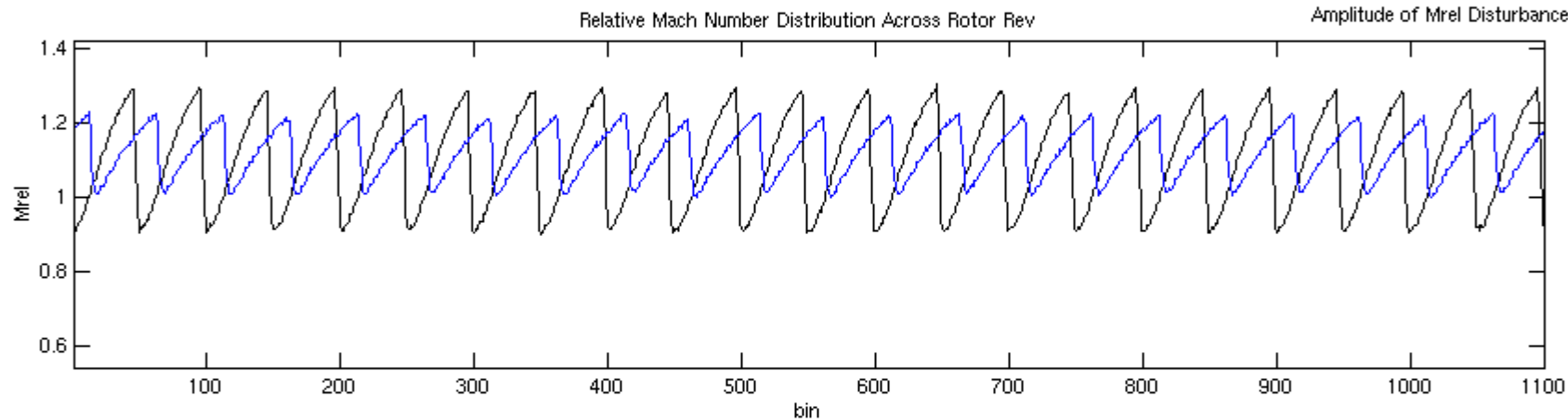
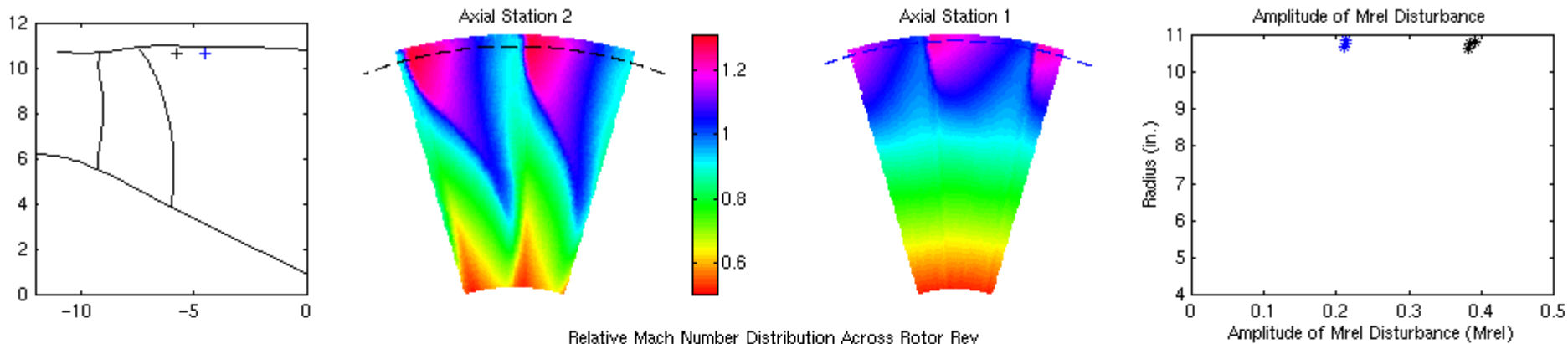


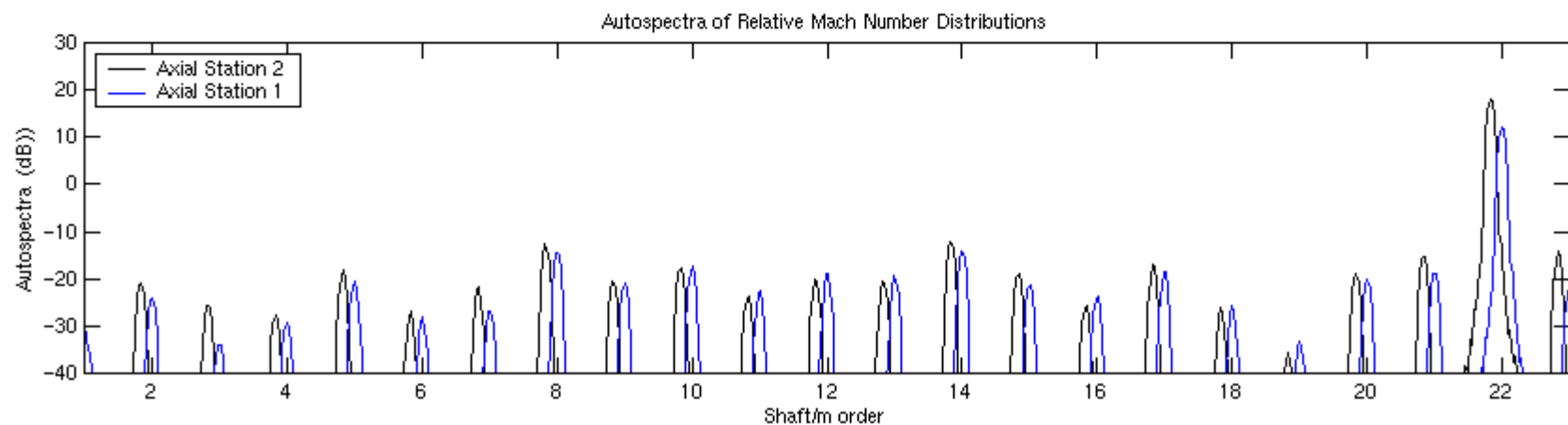
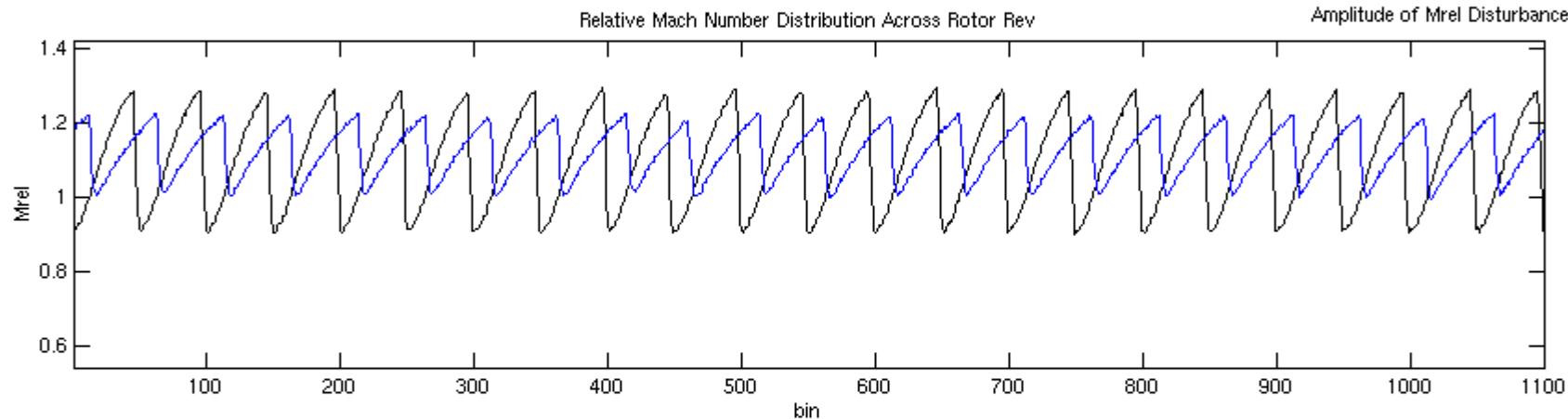
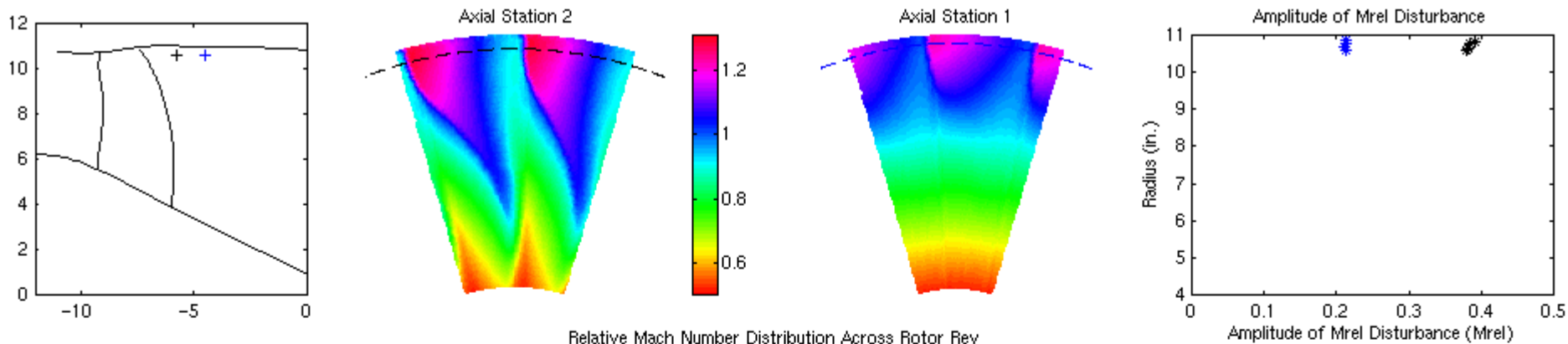
Figure 26.—Slideshow (36 slides) illustrating how the perturbation in the flow measured at axial stations 1 and 2 upstream of the aft-swept fan varies with radial location at the mid-speed condition. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows autospectra computed from the relative Mach number distributions ($m = 22$ corresponds to the blade passing frequency). The plot in the upper right-hand corner shows the average amplitude of the relative Mach number distributions (plotted along the x-axis) vs. radial location (plotted along the y-axis). The dashed lines overlaid on top of the color contour plots show the radial locations at which the data presented on that slide were acquired.

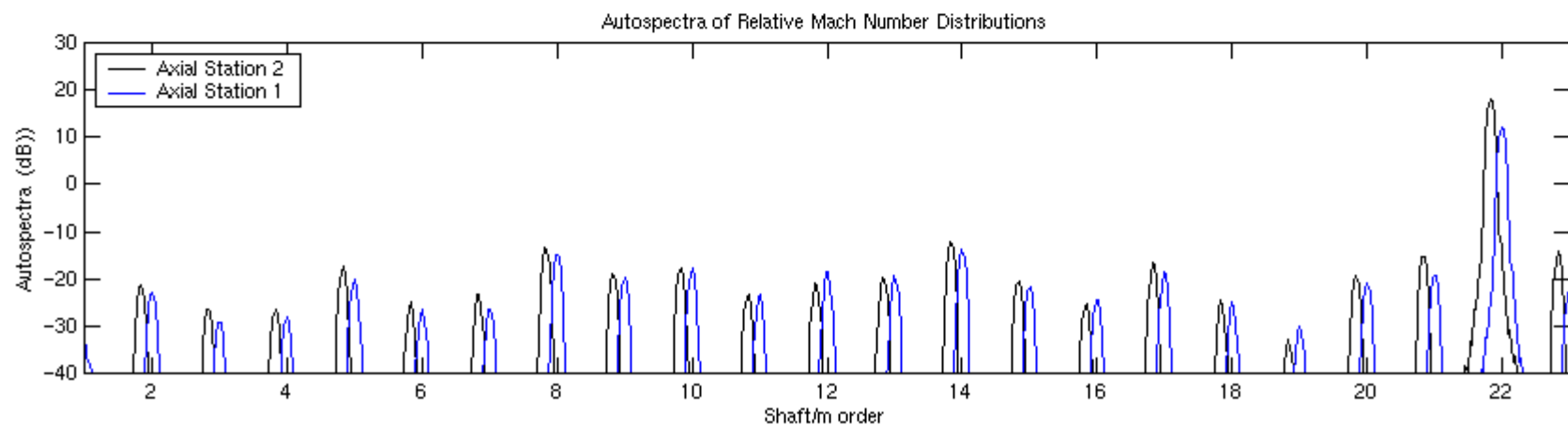
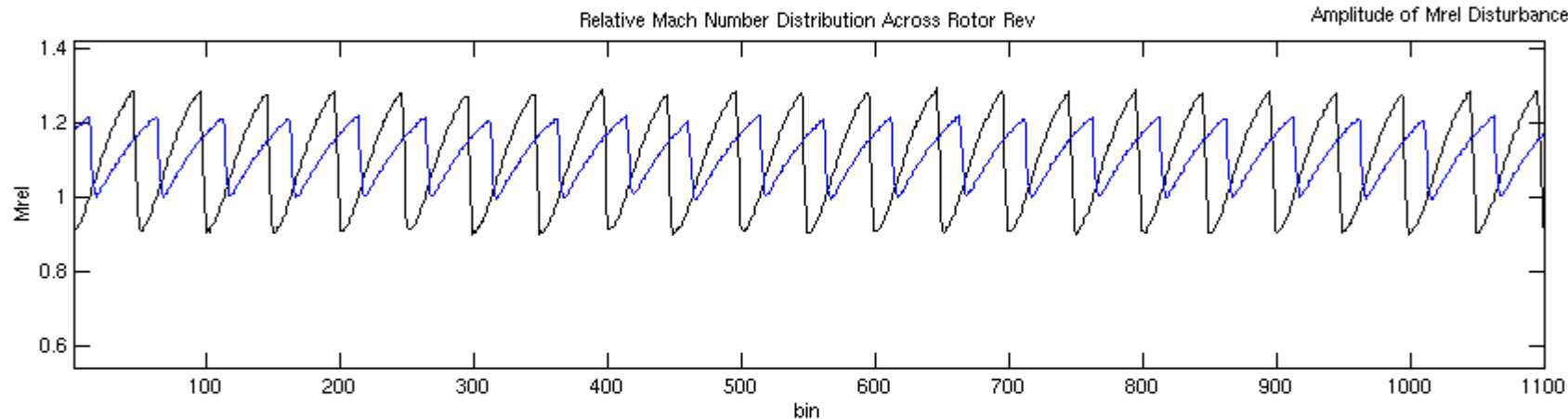
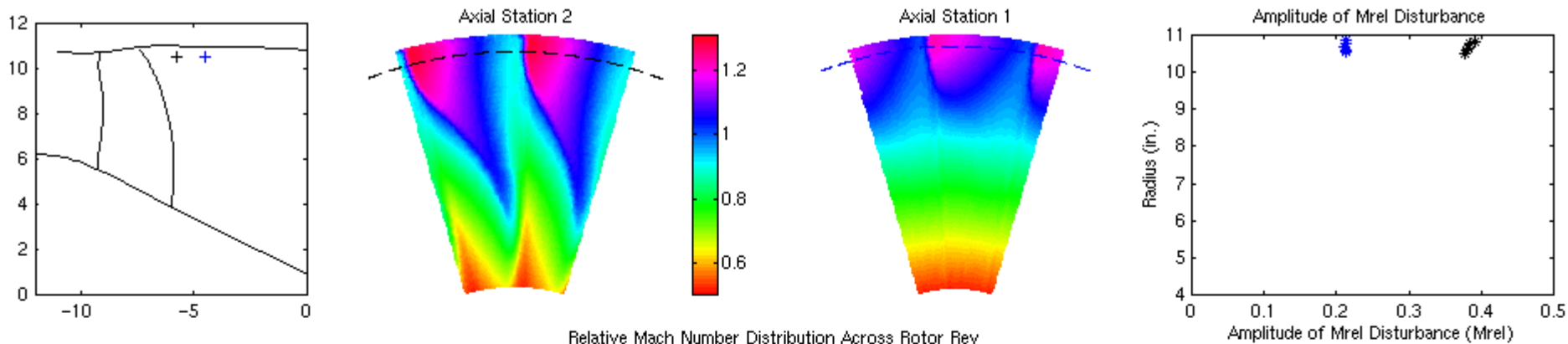


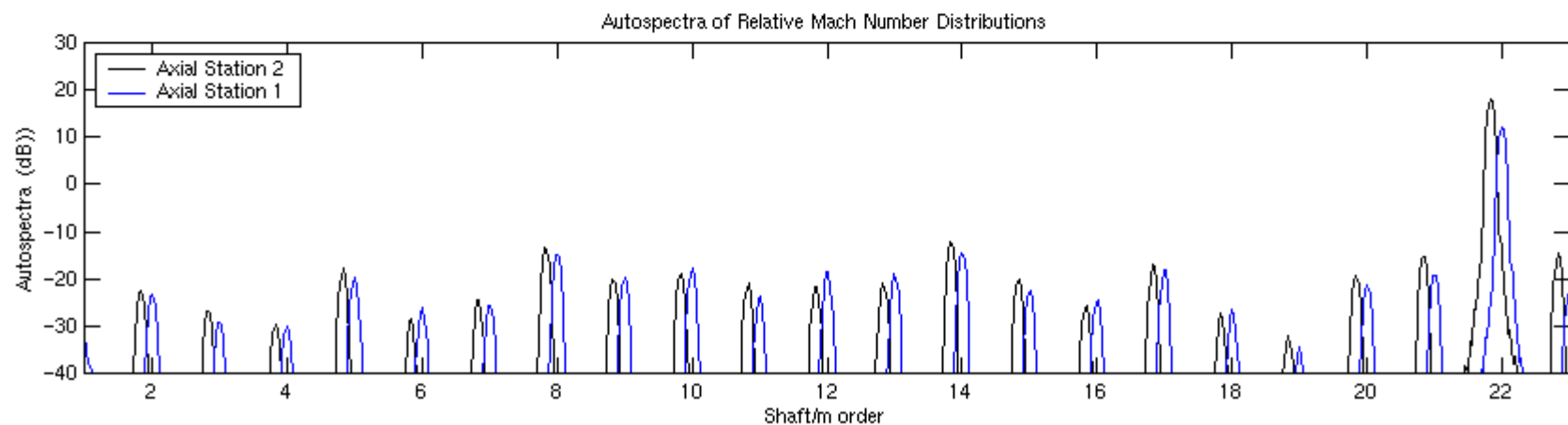
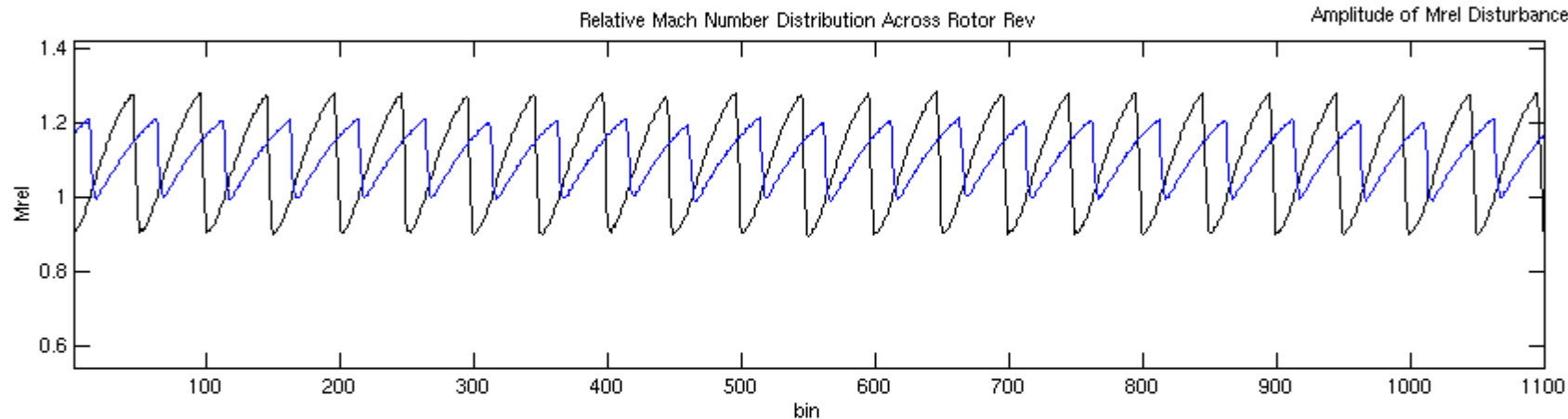
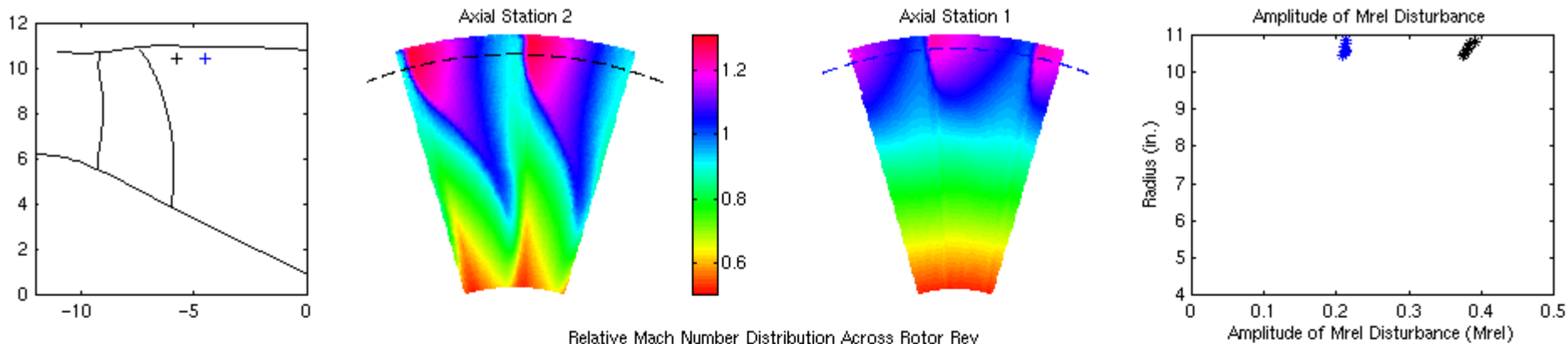
FigKb.m

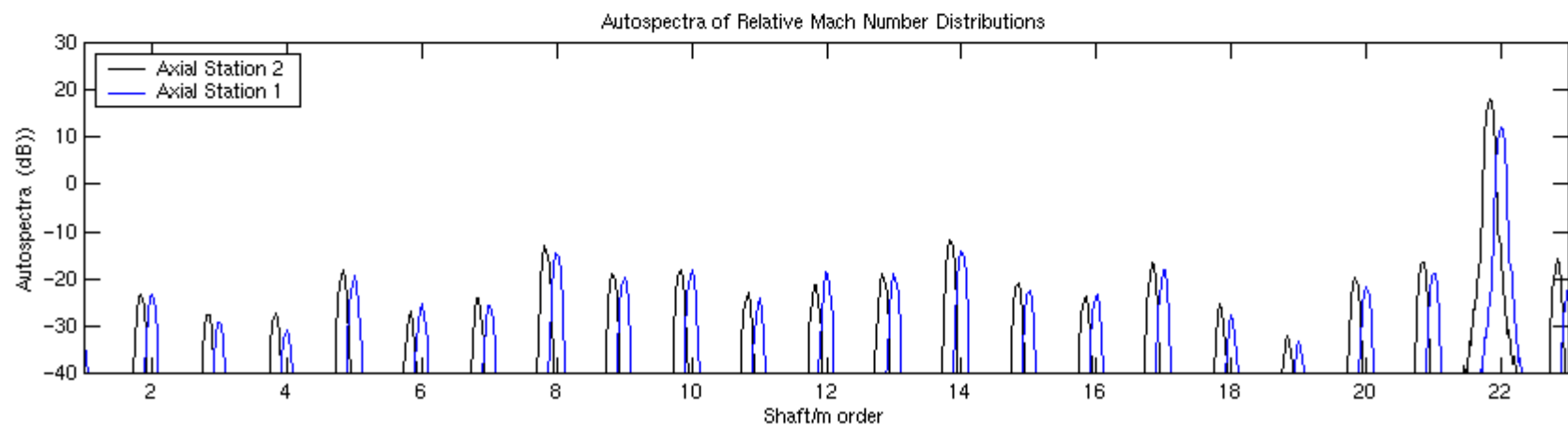
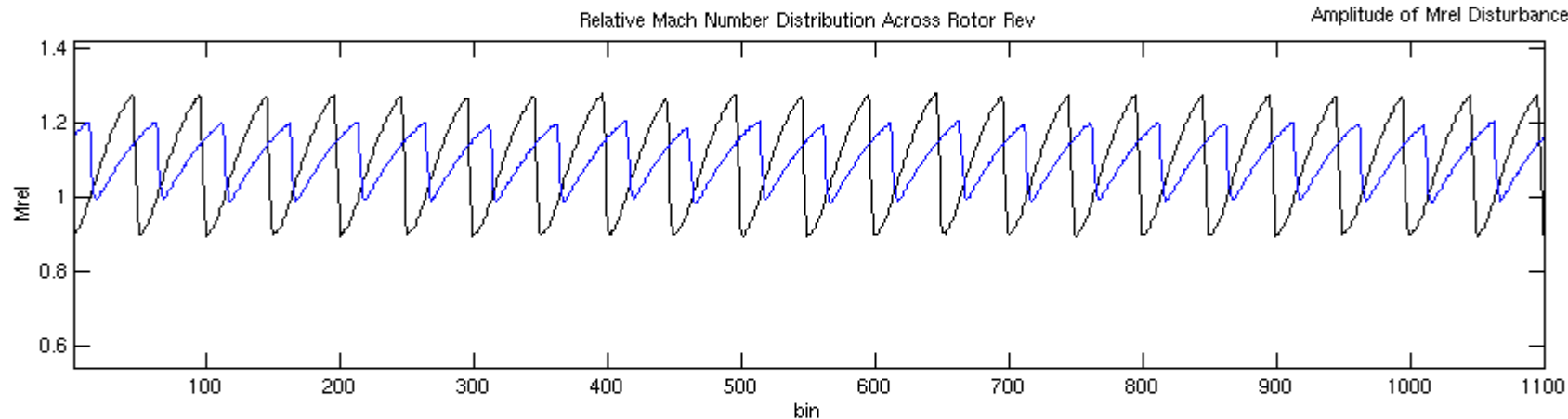
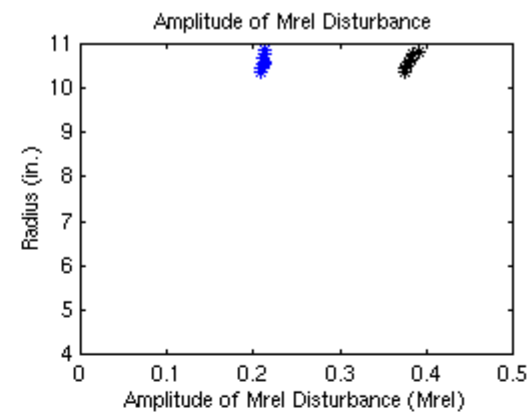
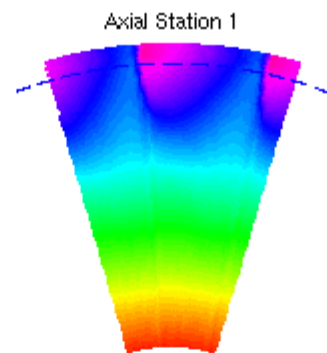
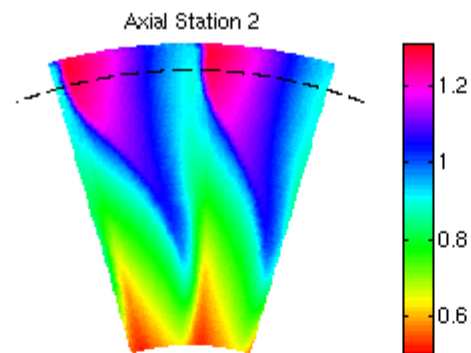
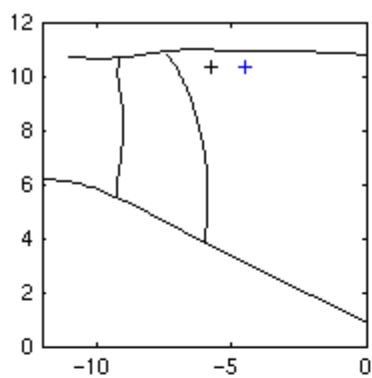


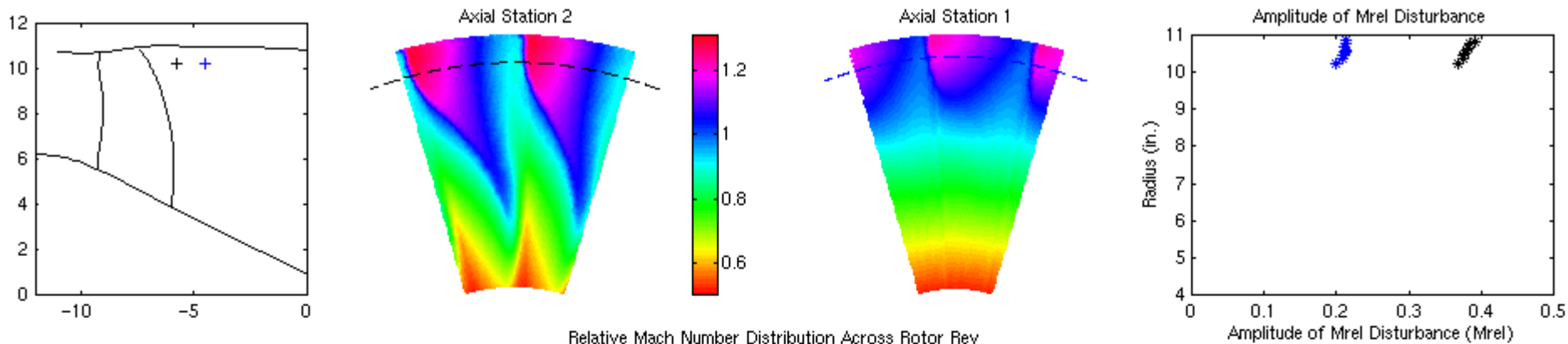




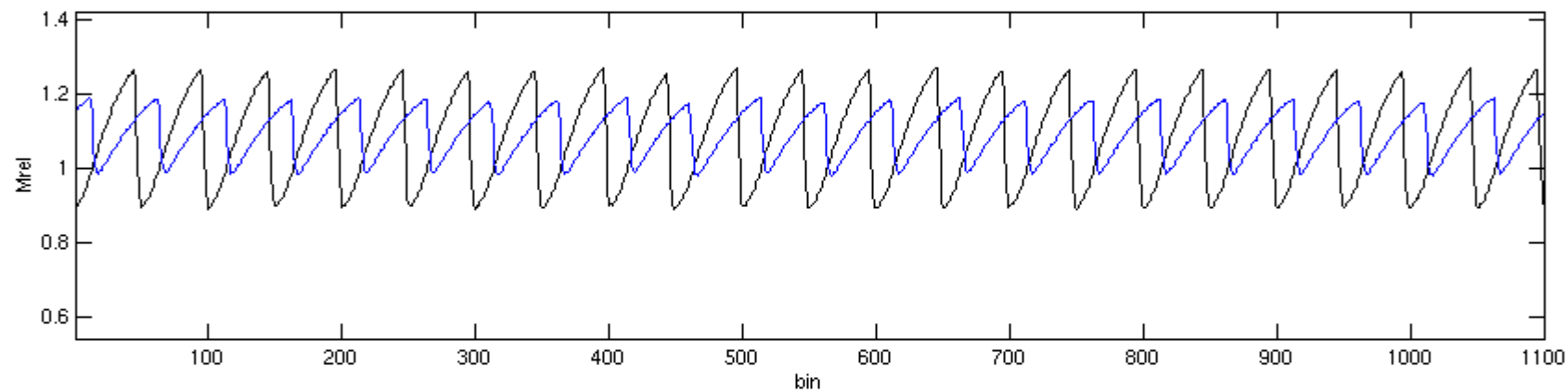




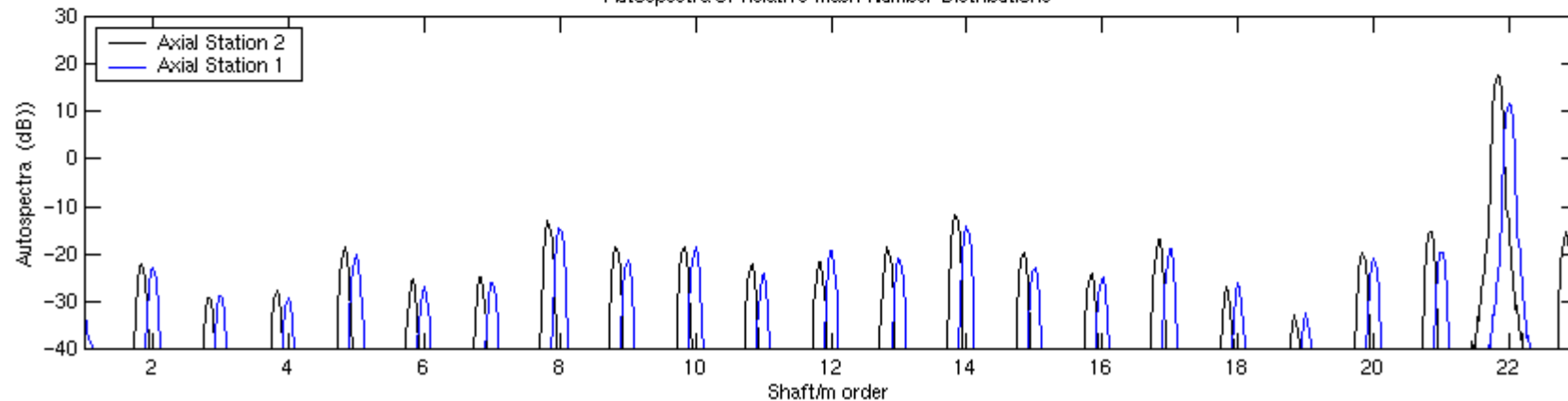


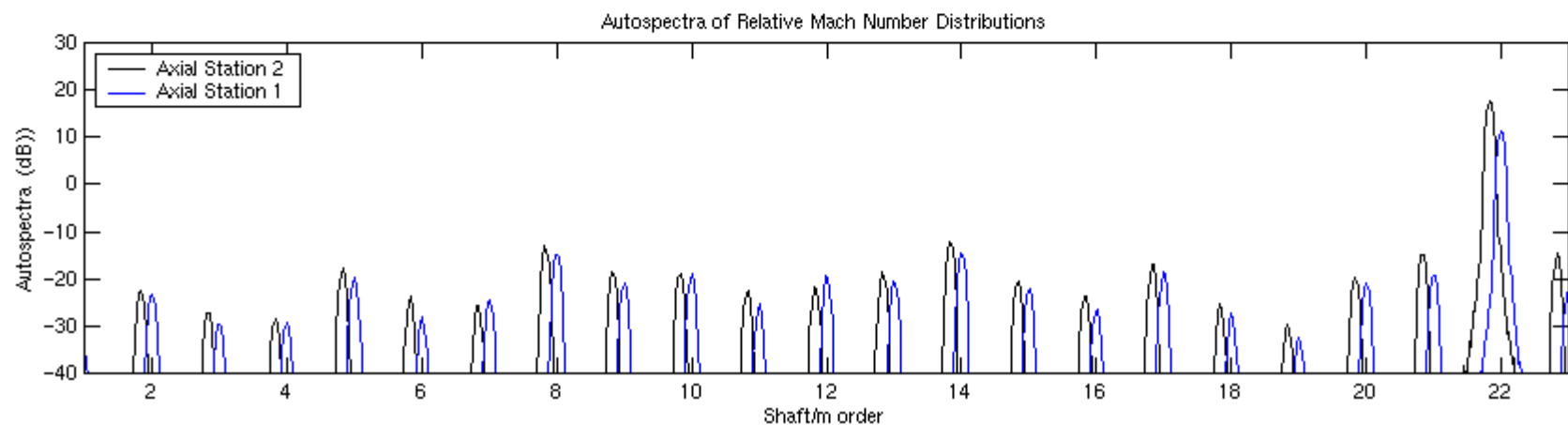
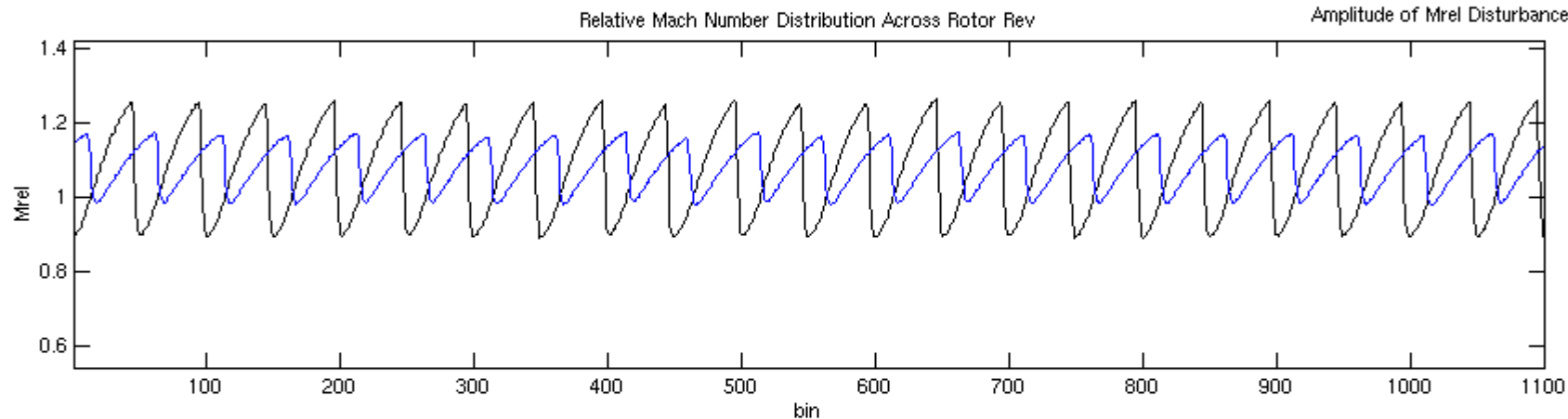
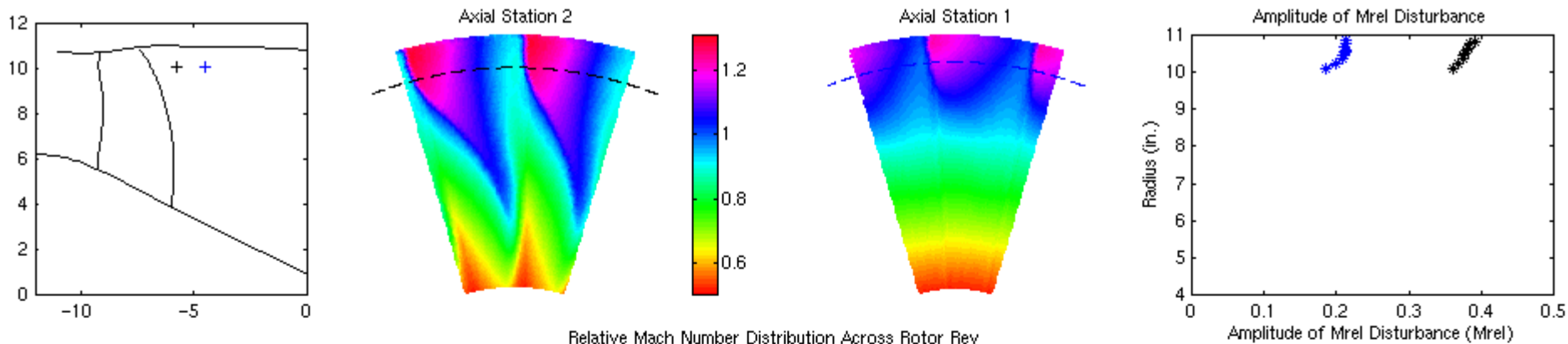


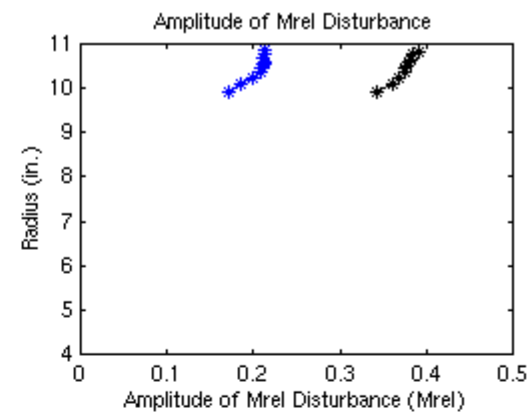
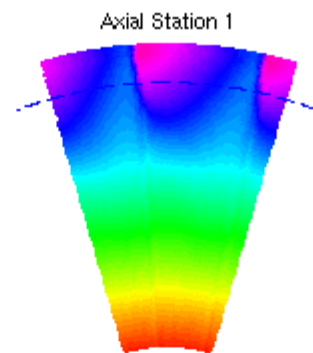
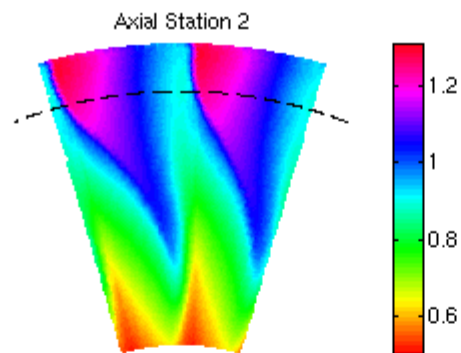
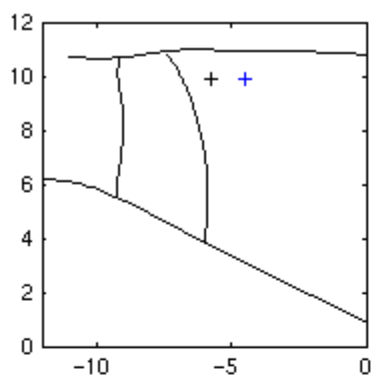
Relative Mach Number Distribution Across Rotor Rev



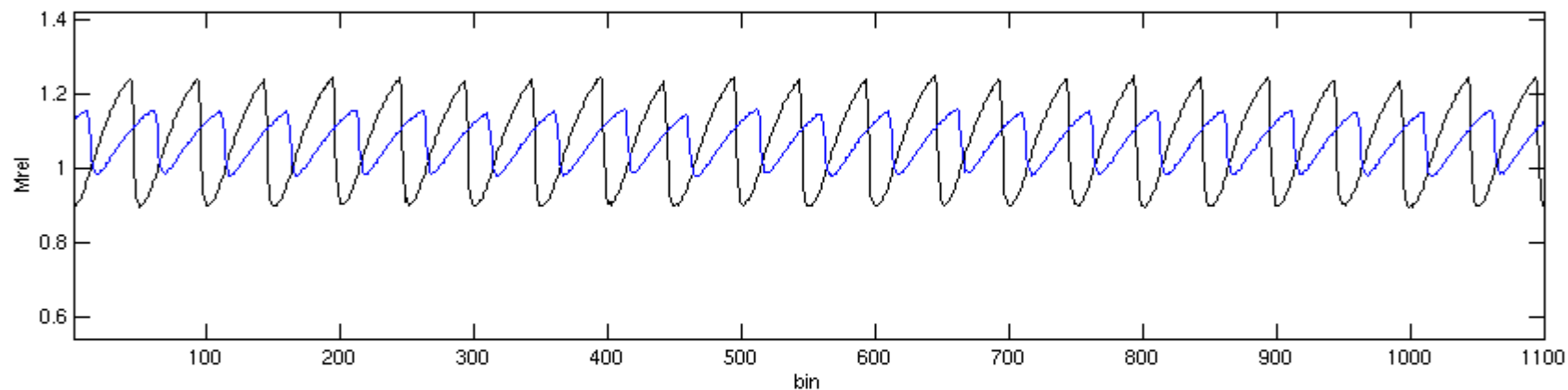
Autospectra of Relative Mach Number Distributions



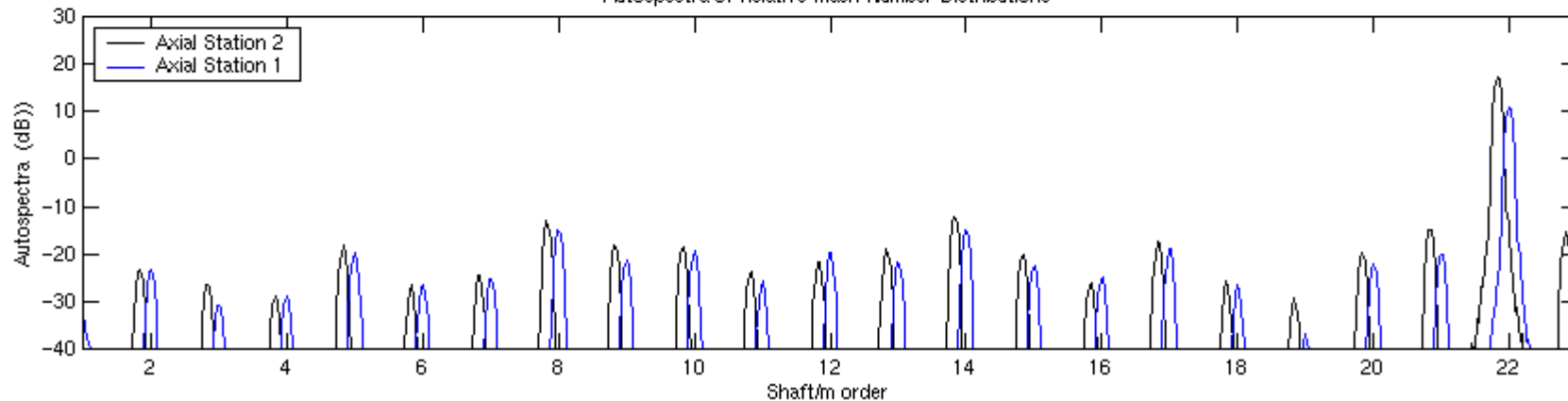


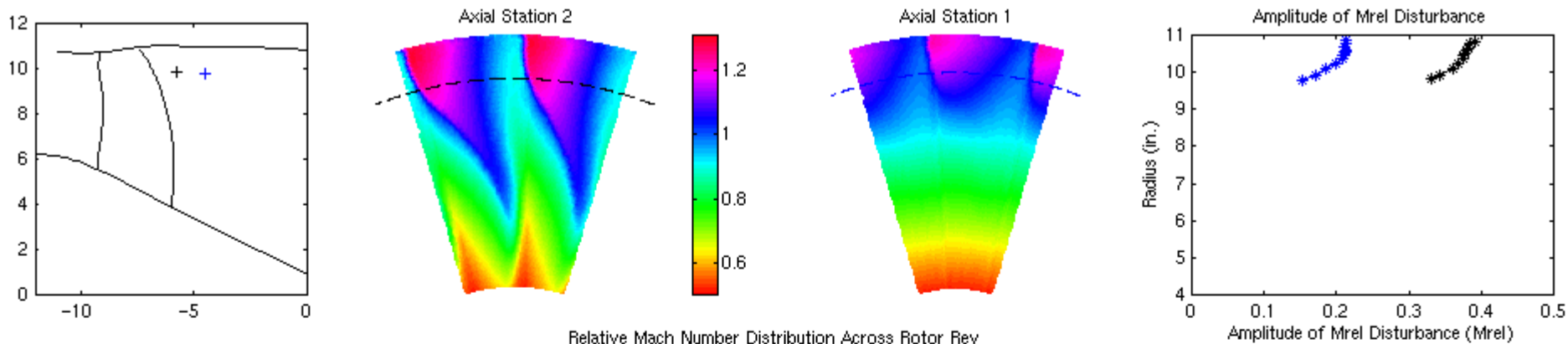


Relative Mach Number Distribution Across Rotor Rev

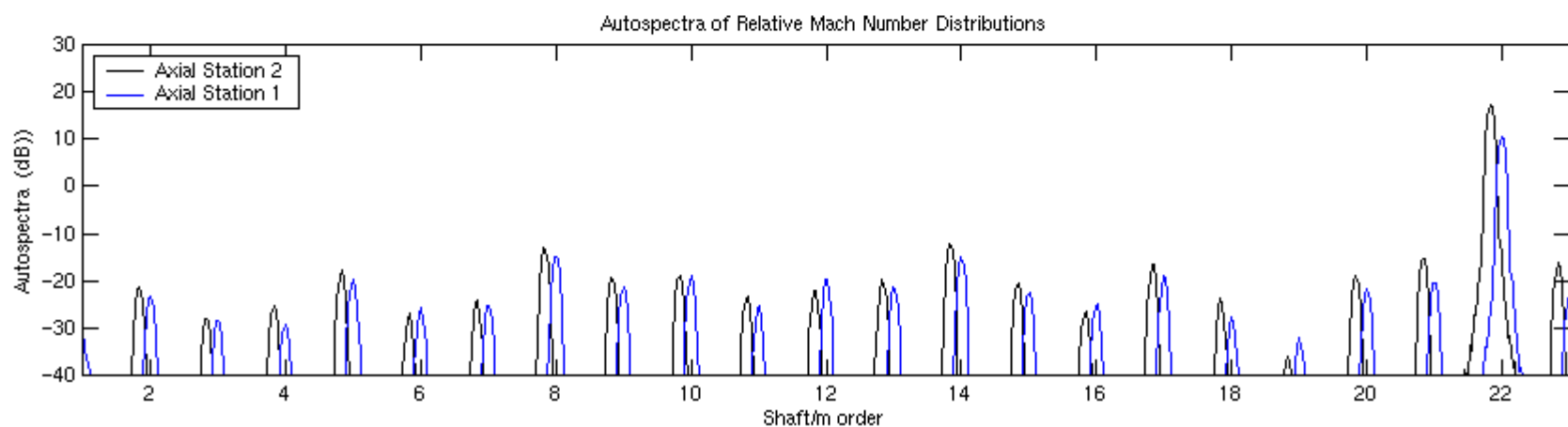
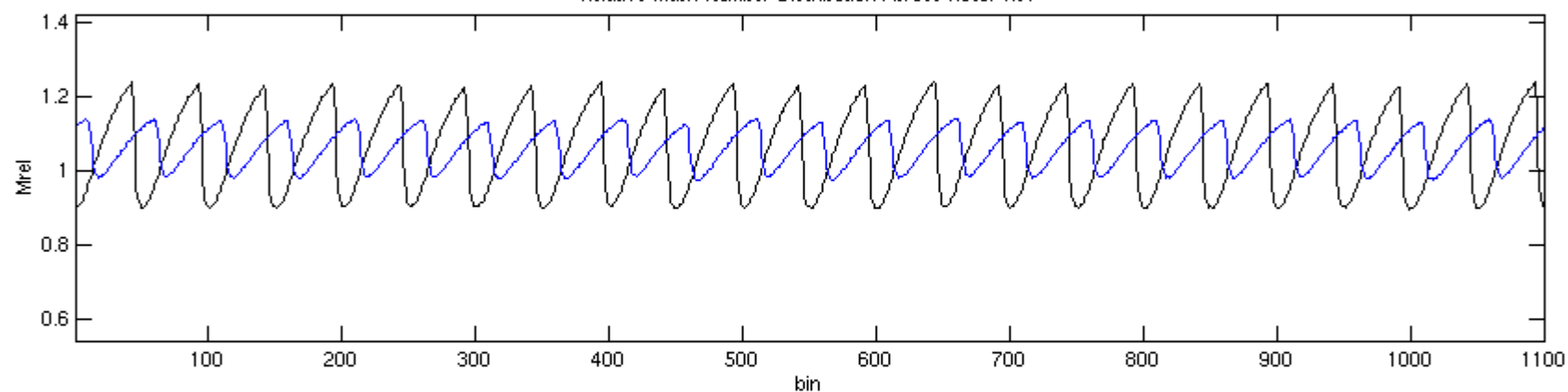


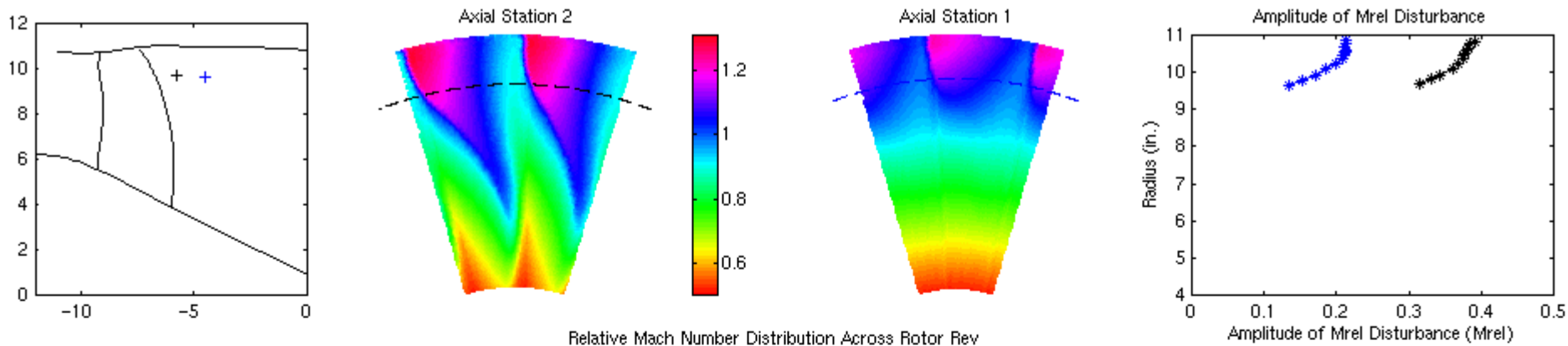
Autospectra of Relative Mach Number Distributions



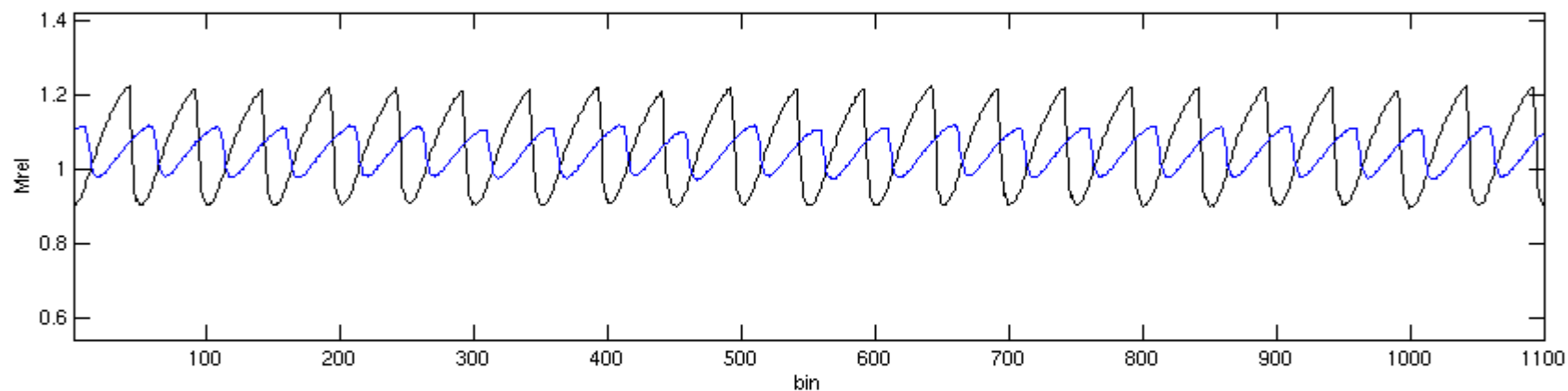


Relative Mach Number Distribution Across Rotor Rev

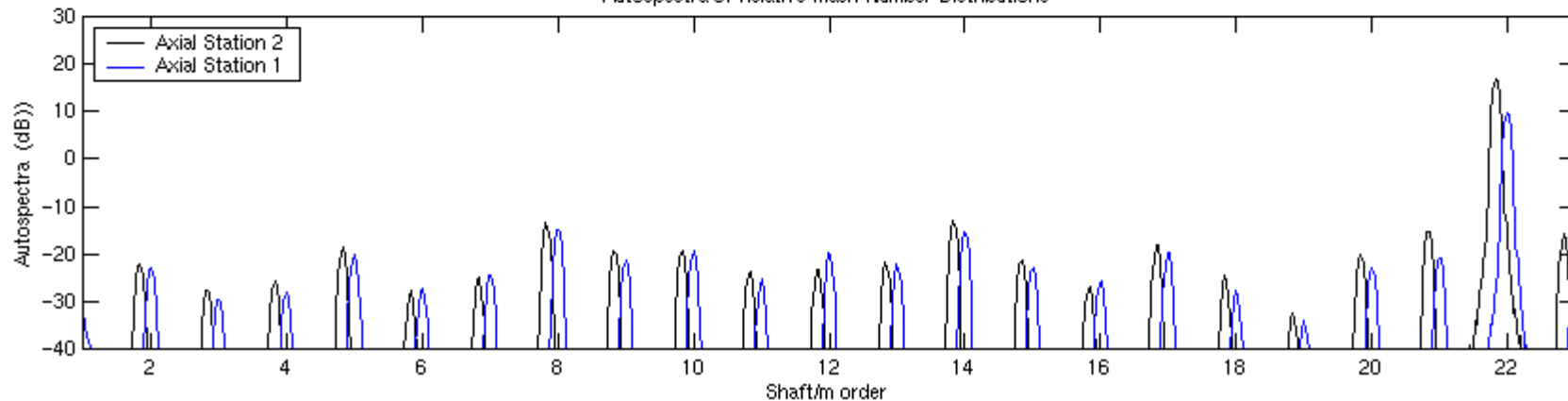


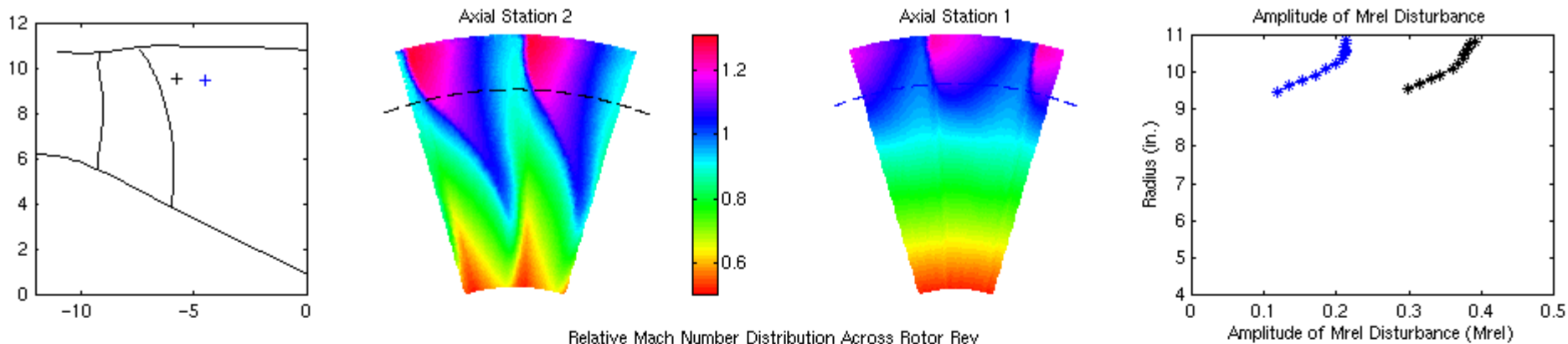


Relative Mach Number Distribution Across Rotor Rev

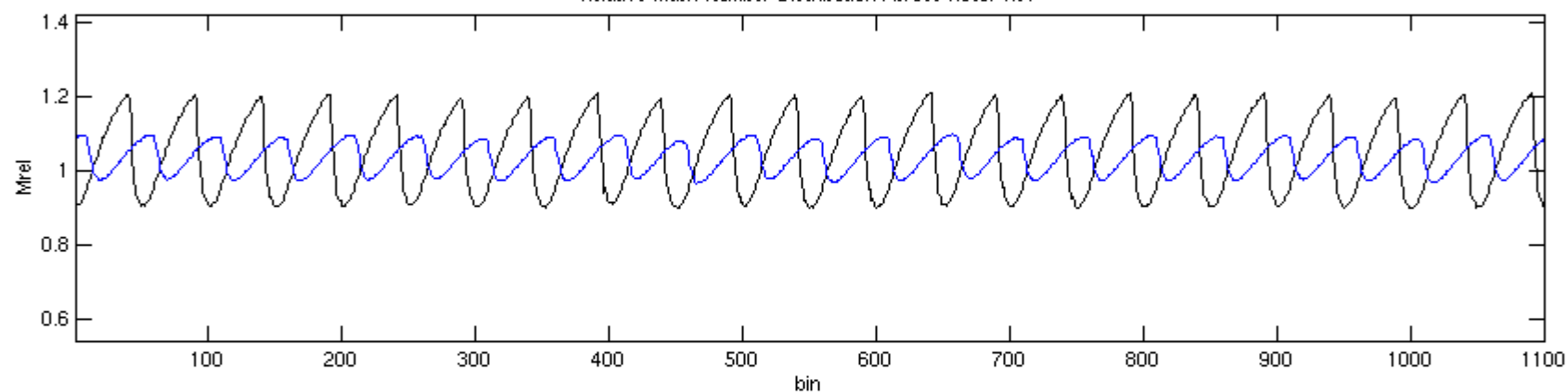


Autospectra of Relative Mach Number Distributions

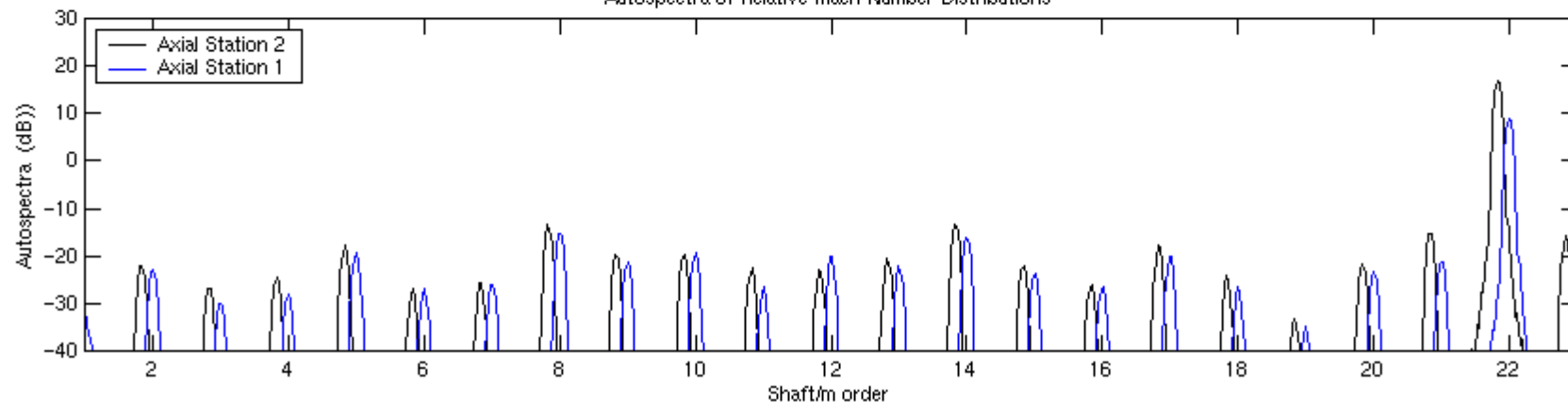


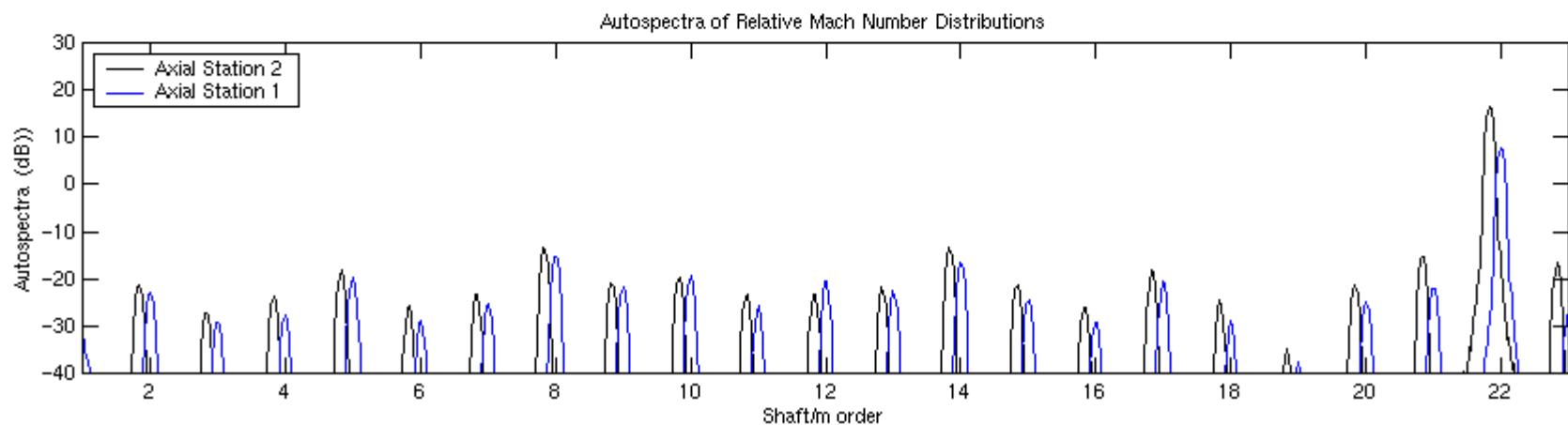
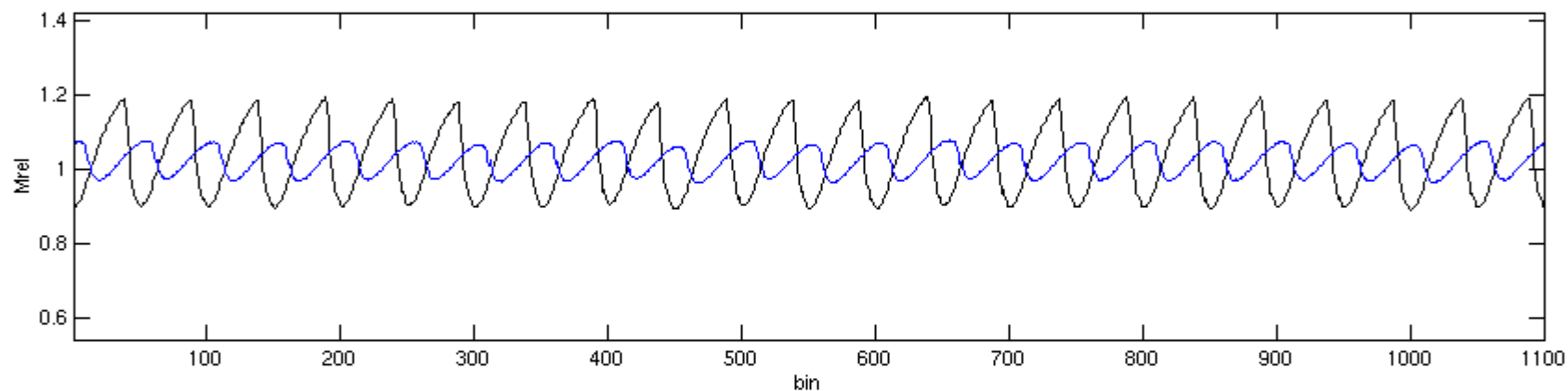
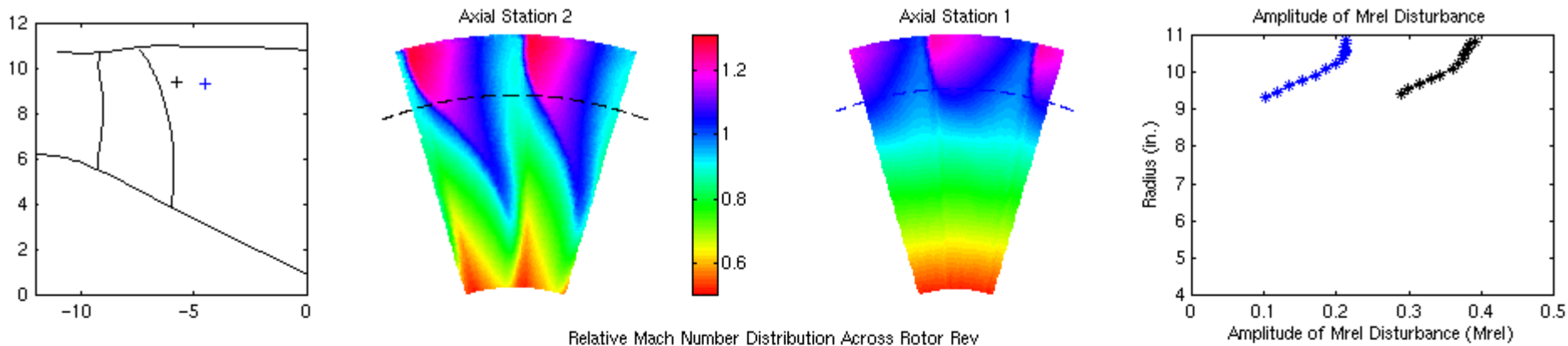


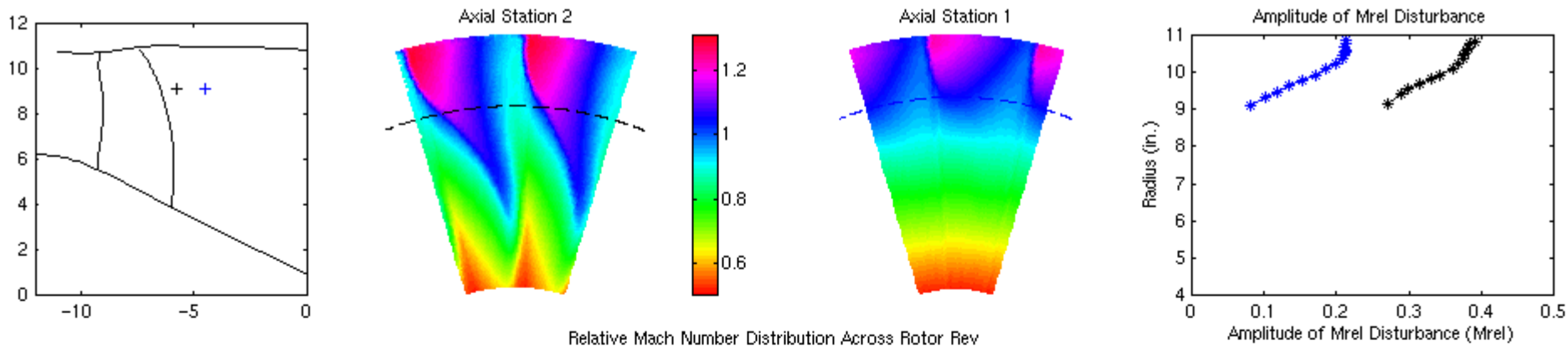
Relative Mach Number Distribution Across Rotor Rev



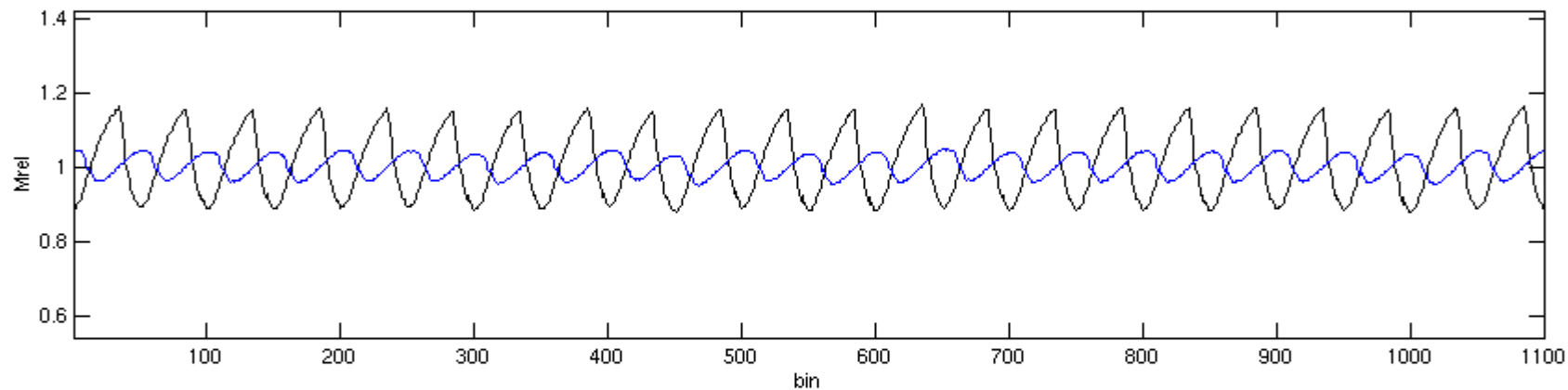
Autospectra of Relative Mach Number Distributions



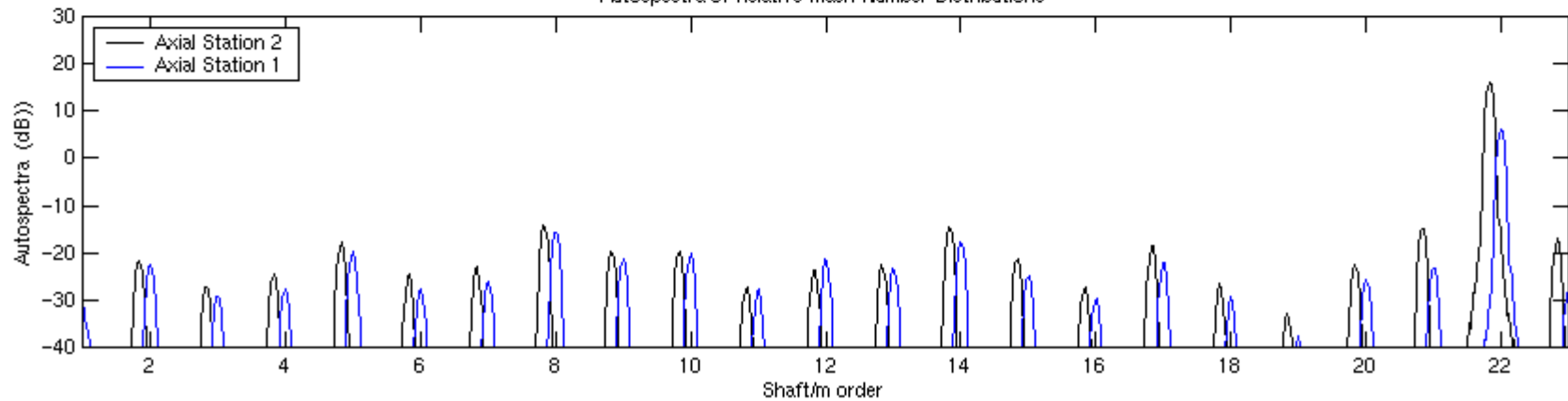


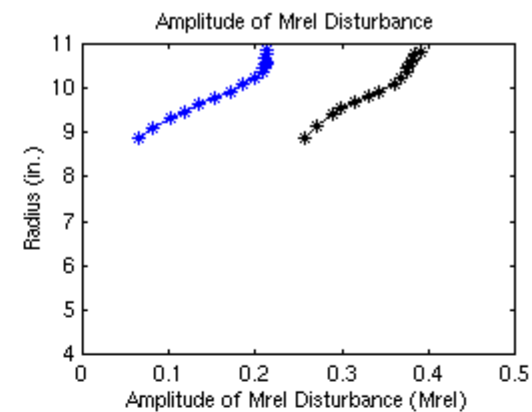
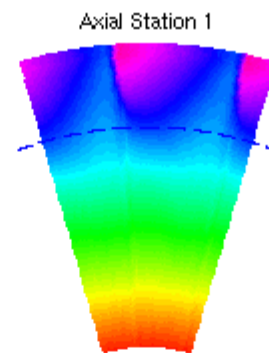
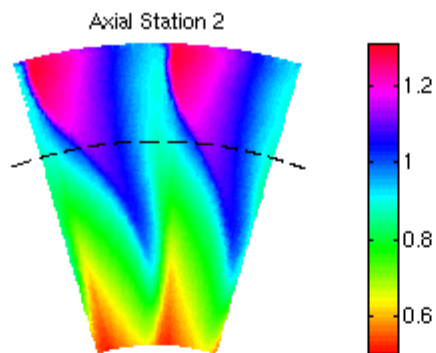
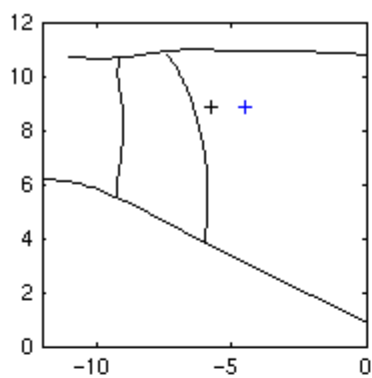


Relative Mach Number Distribution Across Rotor Rev

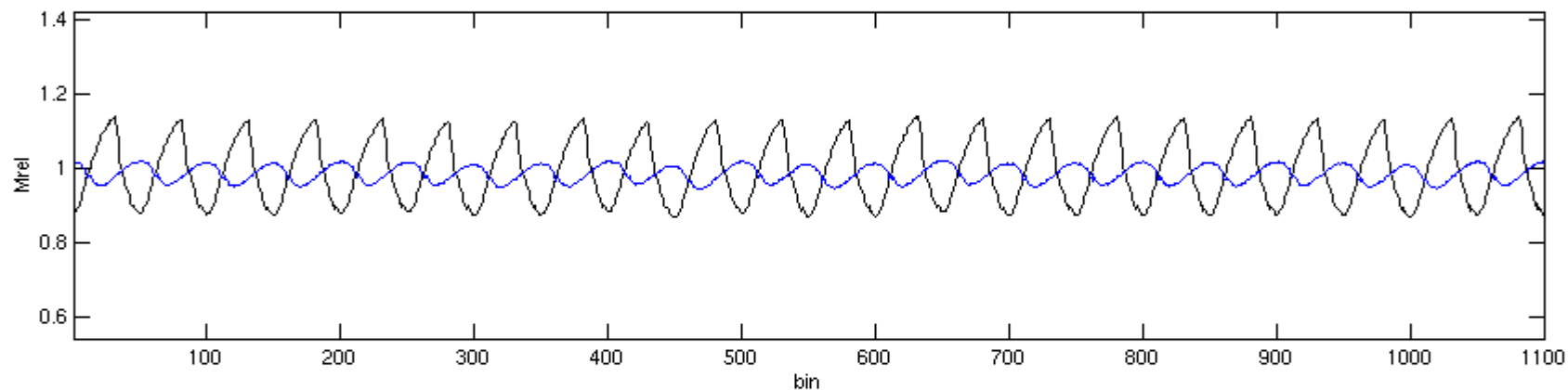


Autospectra of Relative Mach Number Distributions

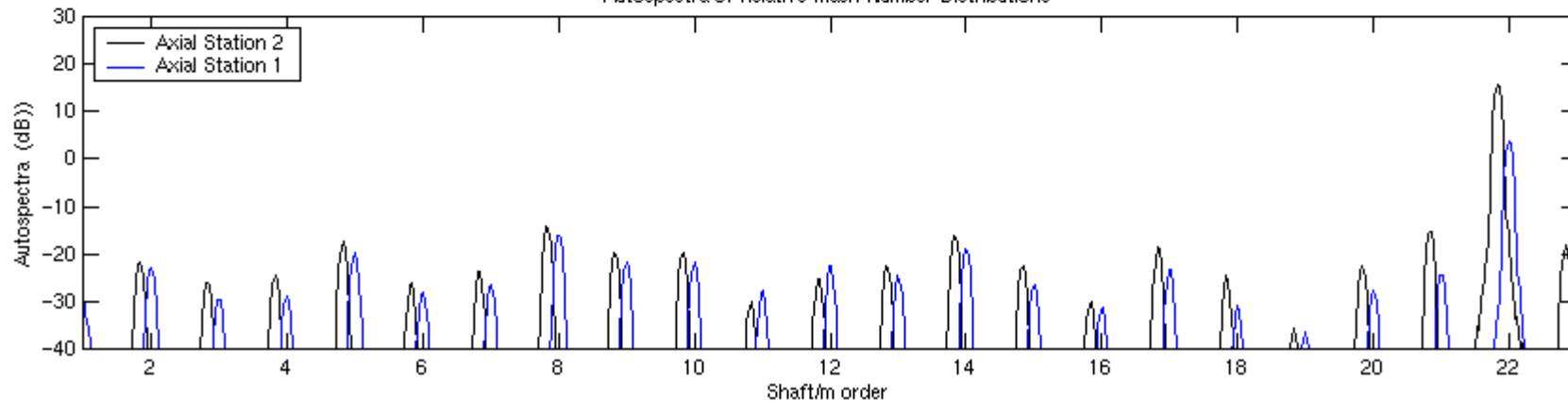


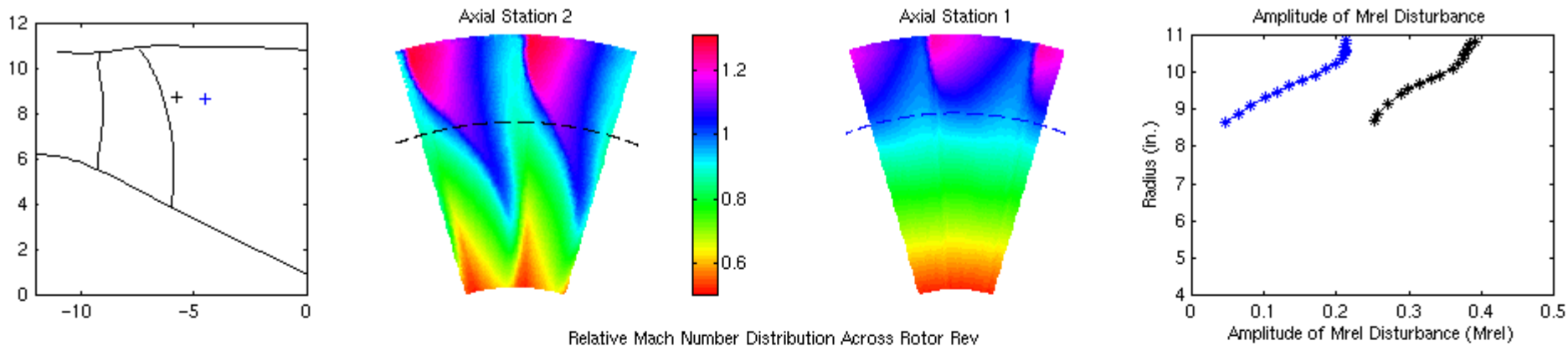


Relative Mach Number Distribution Across Rotor Rev

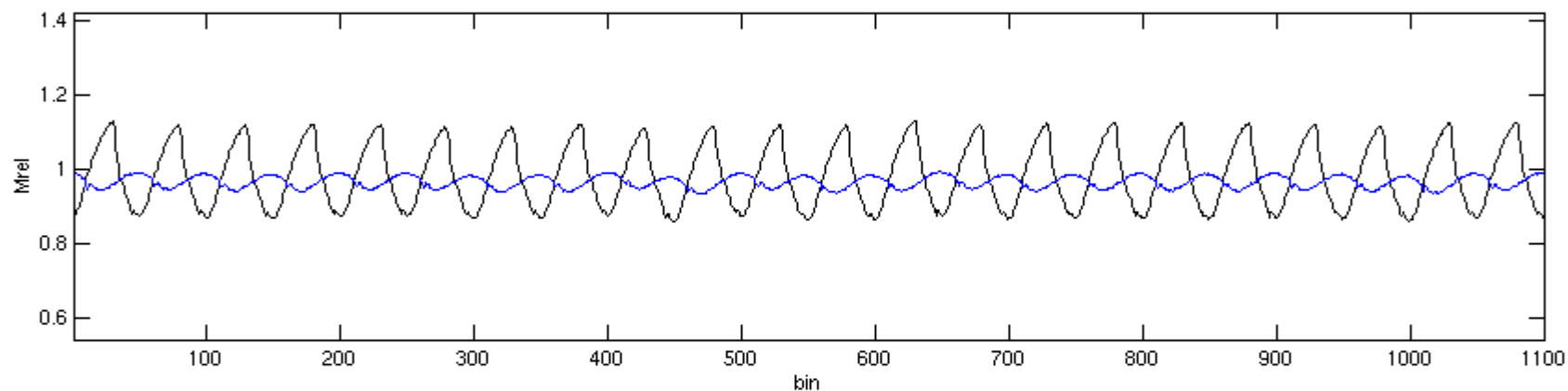


Autospectra of Relative Mach Number Distributions

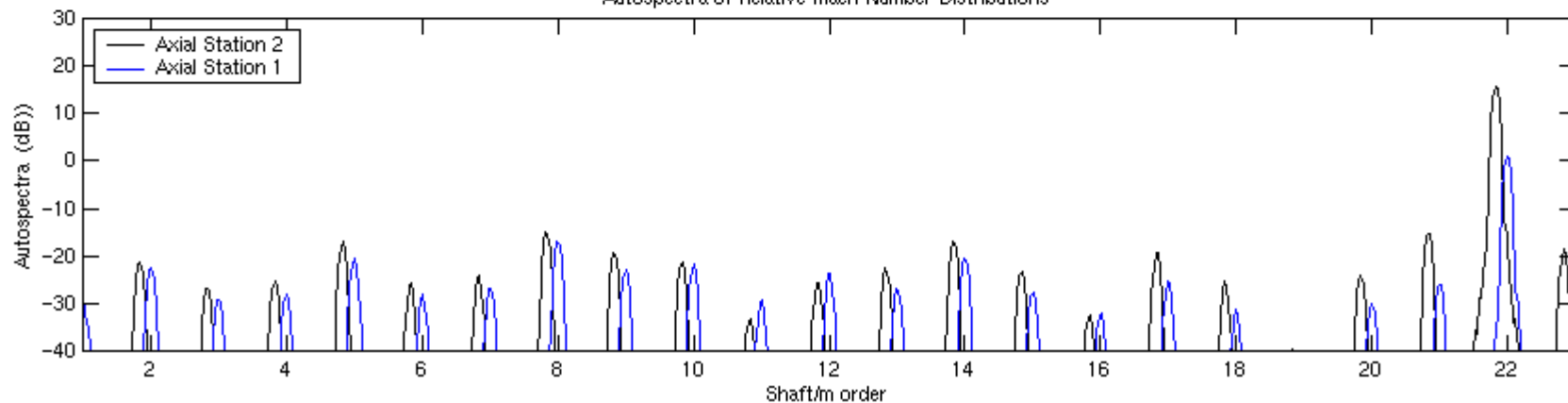


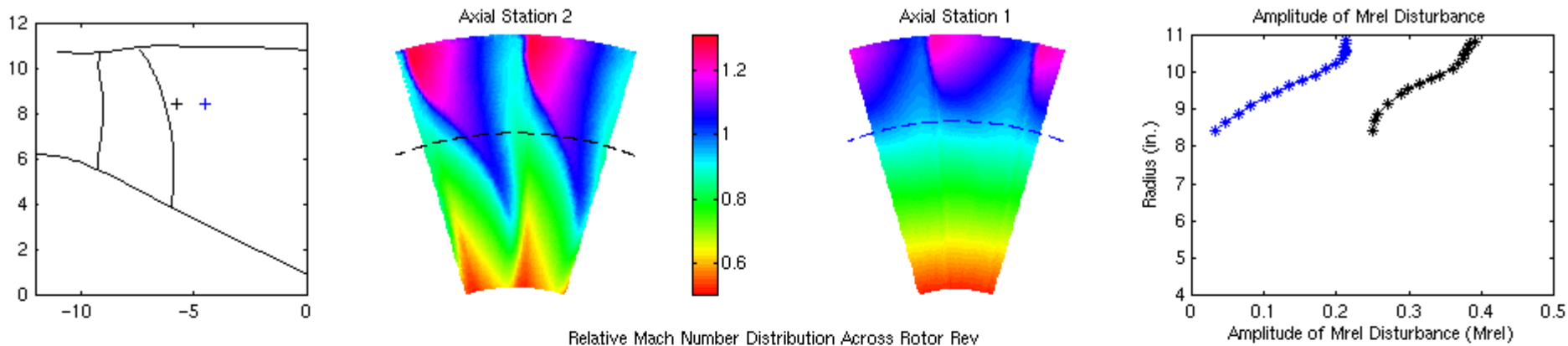


Relative Mach Number Distribution Across Rotor Rev

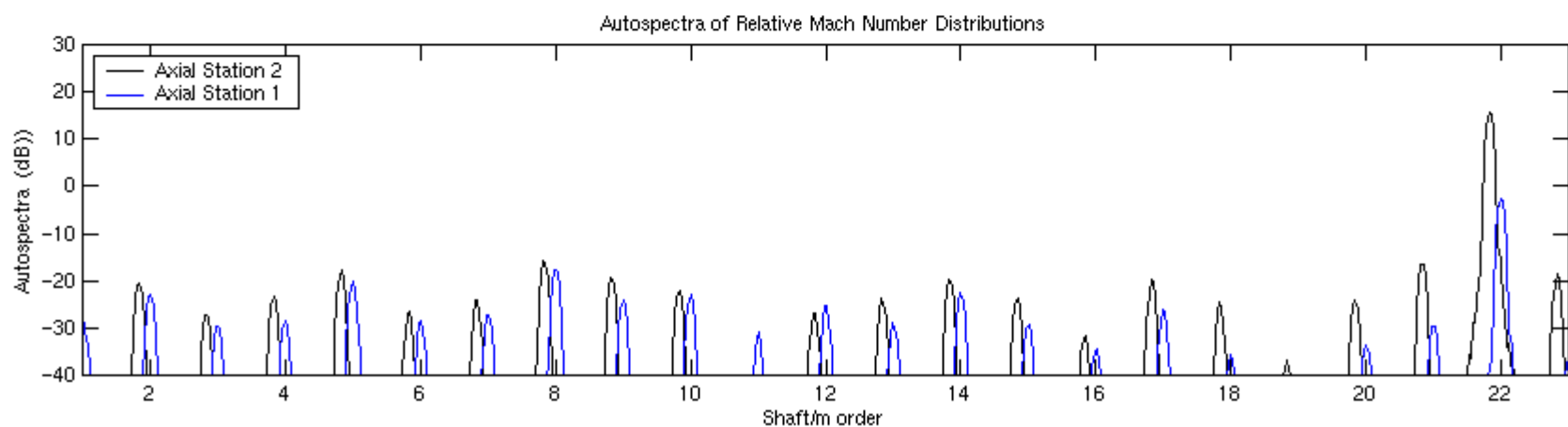
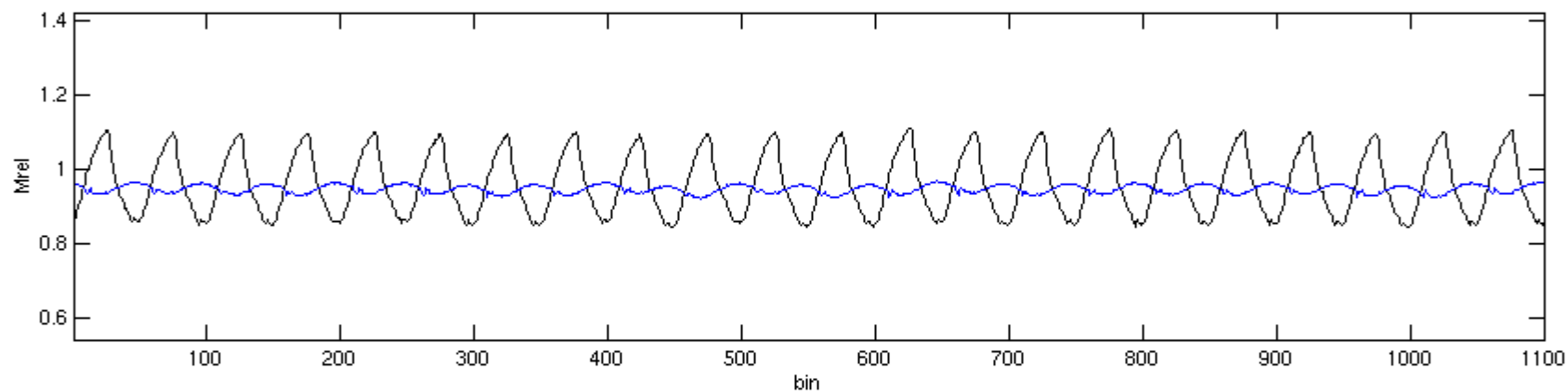


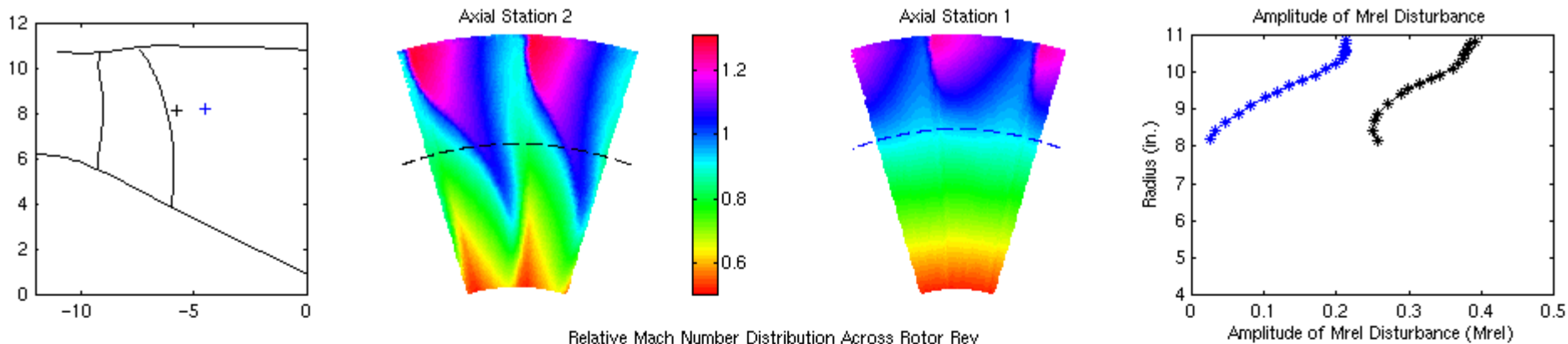
Autospectra of Relative Mach Number Distributions



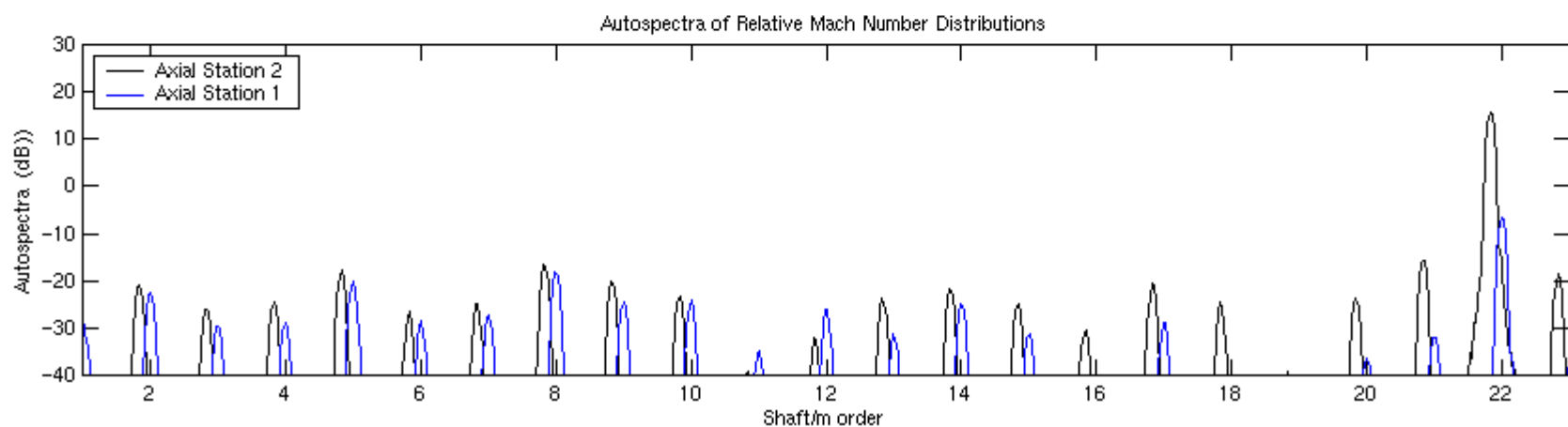
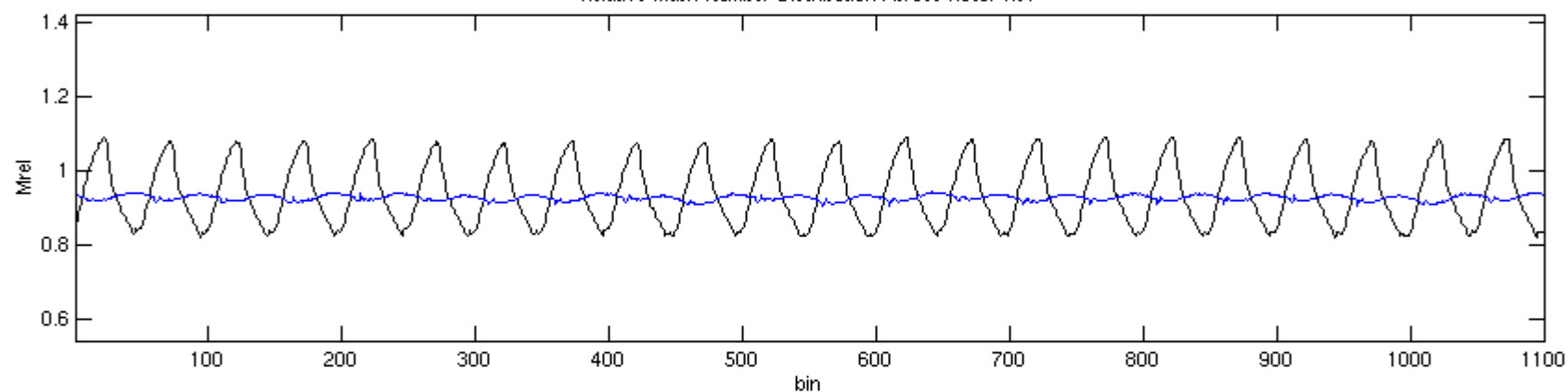


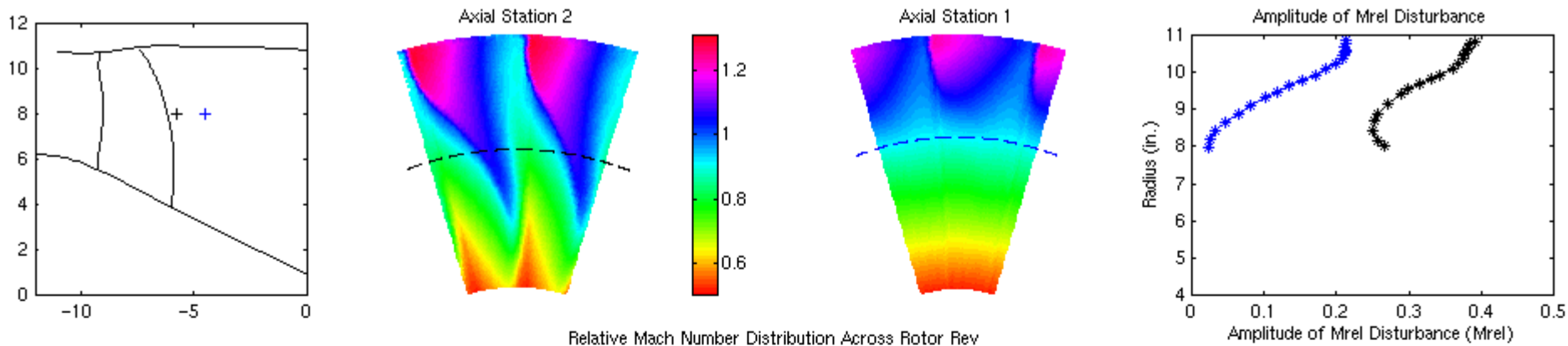
Relative Mach Number Distribution Across Rotor Rev



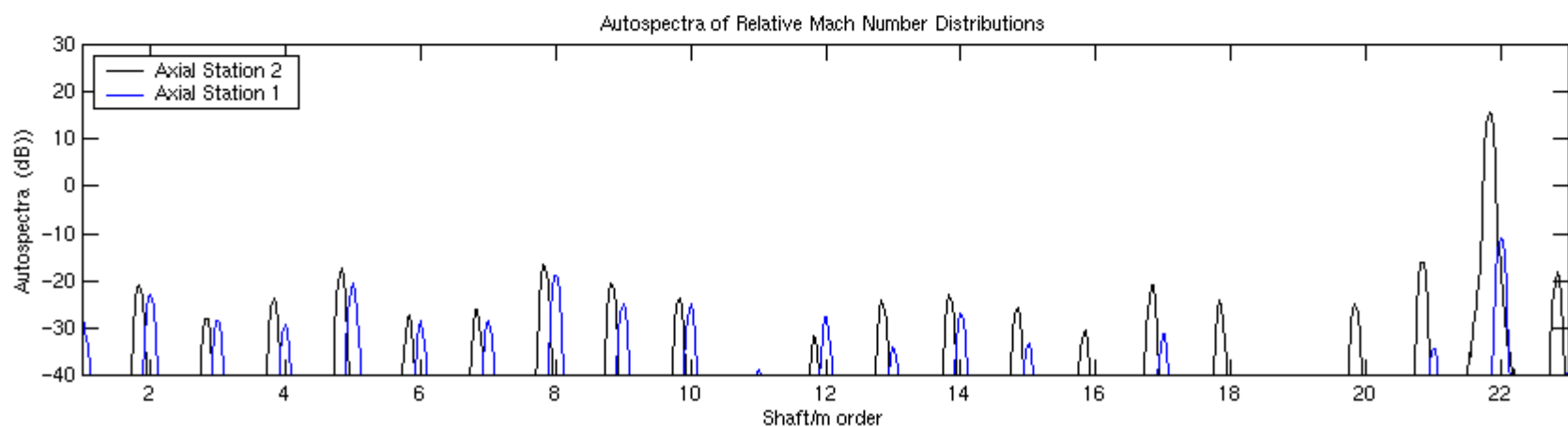
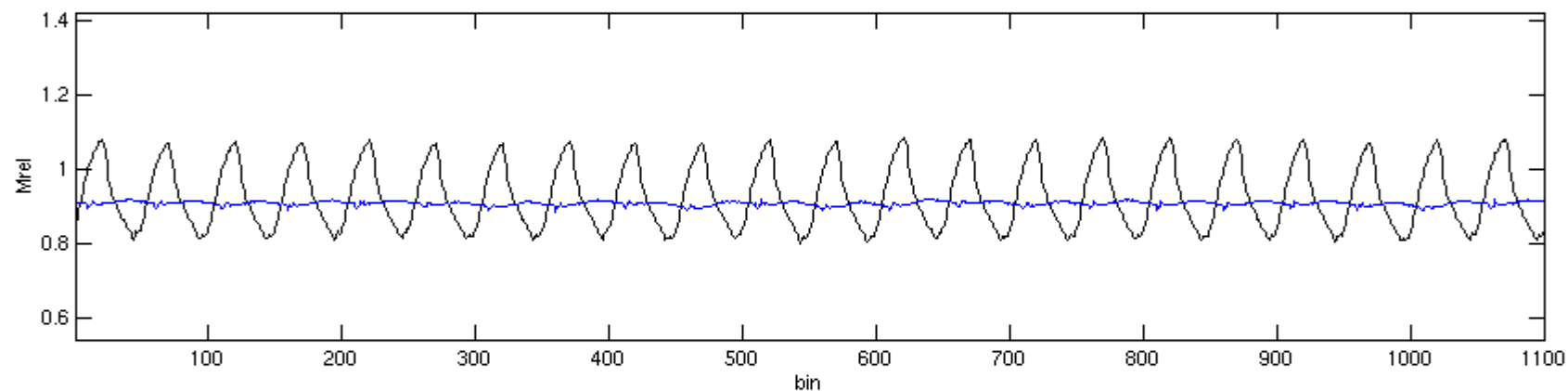


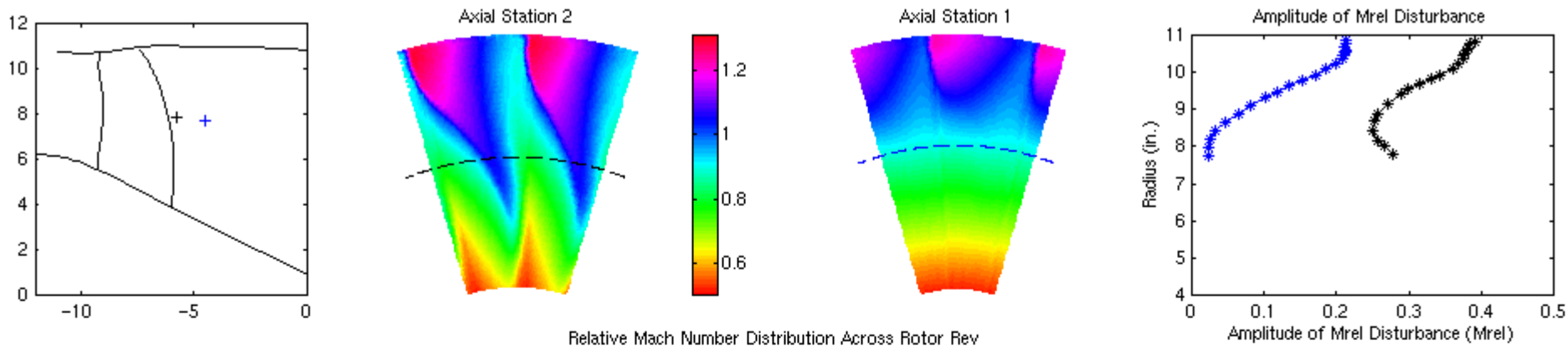
Relative Mach Number Distribution Across Rotor Rev



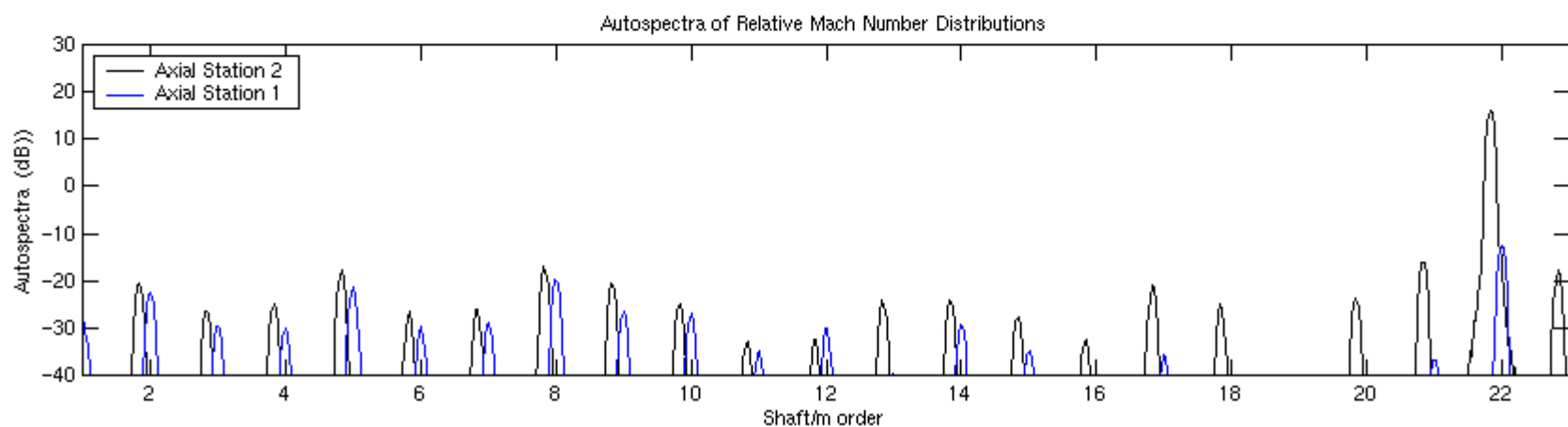
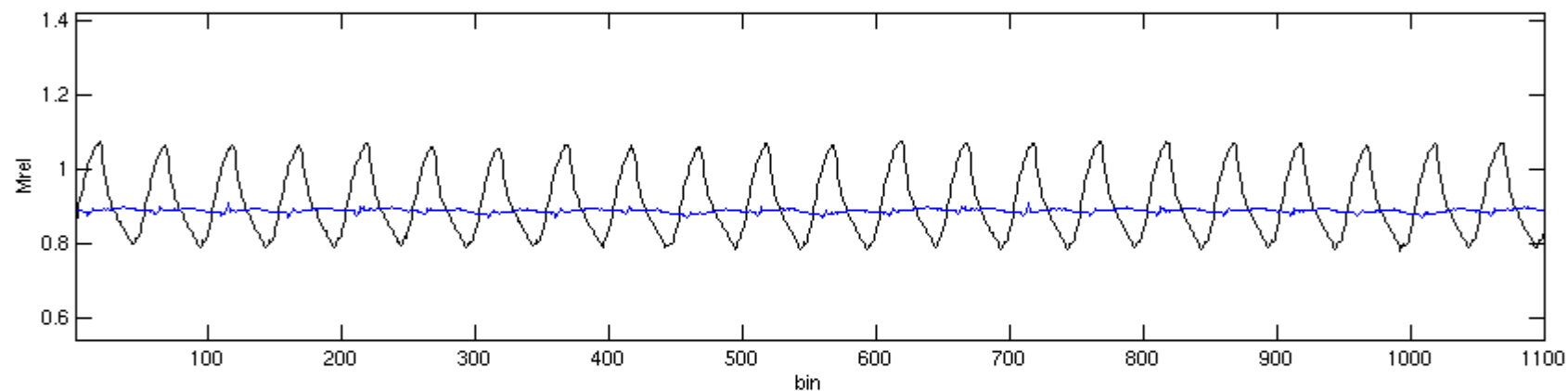


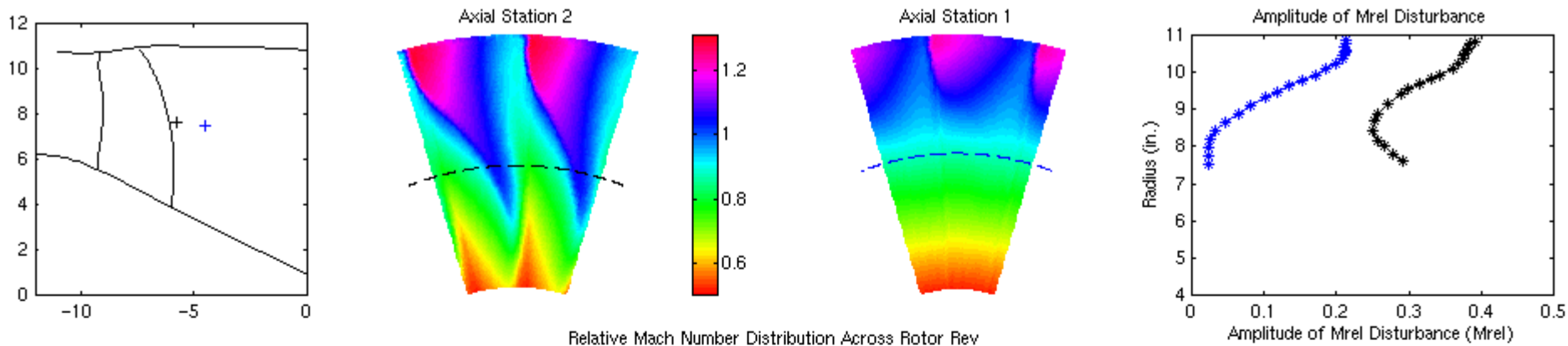
Relative Mach Number Distribution Across Rotor Rev



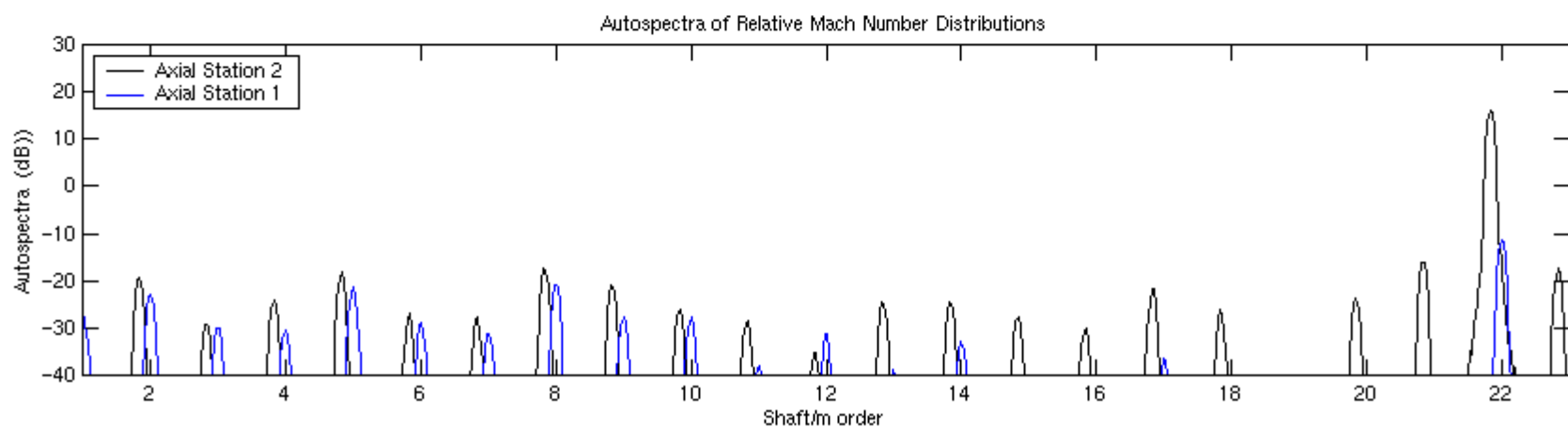
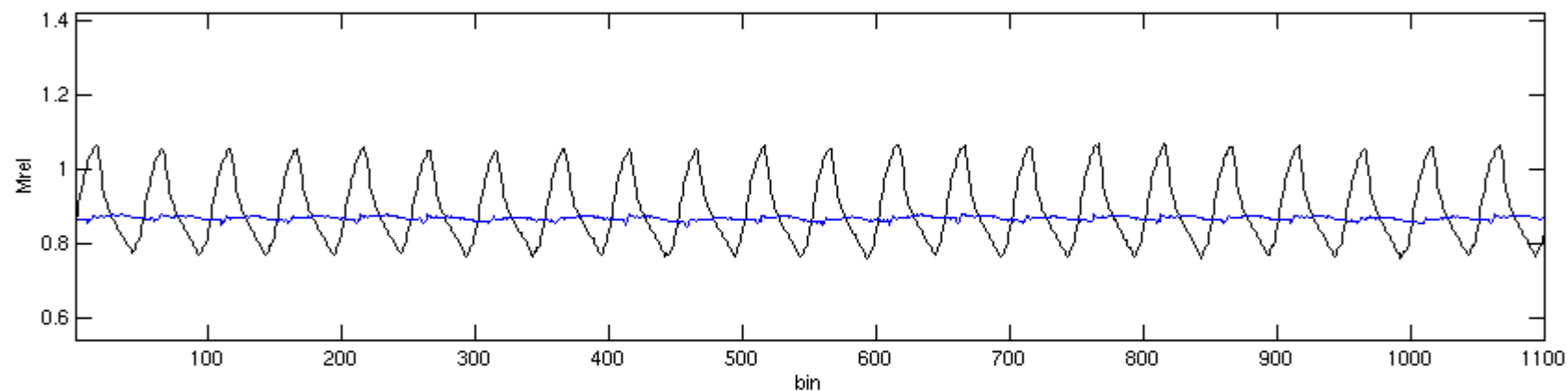


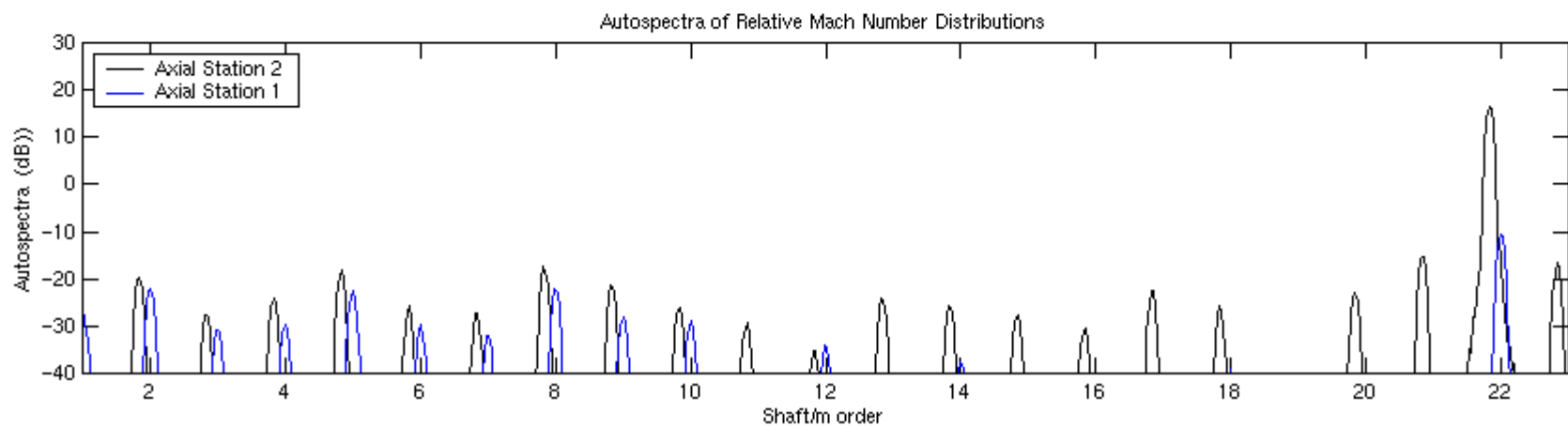
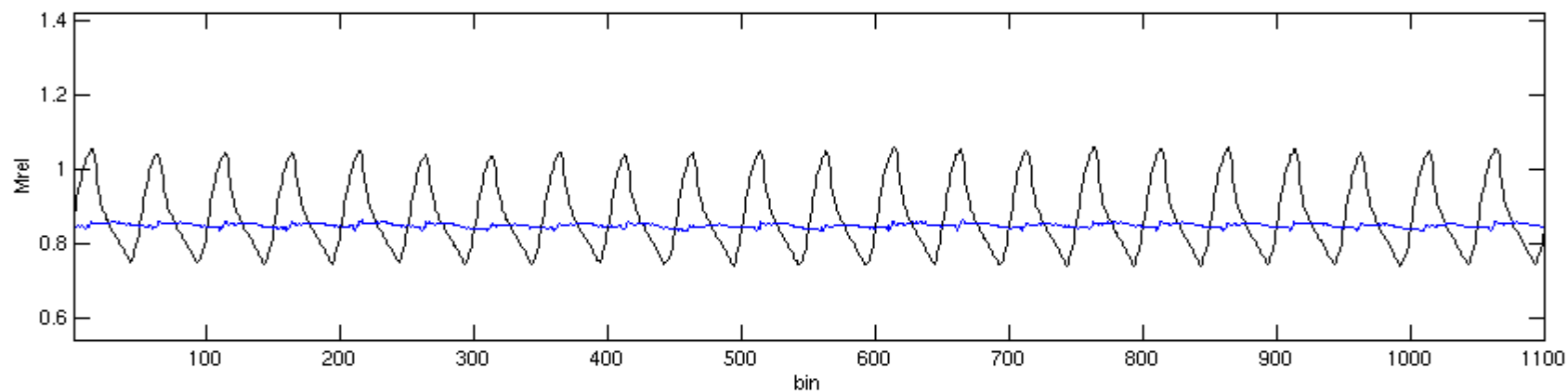
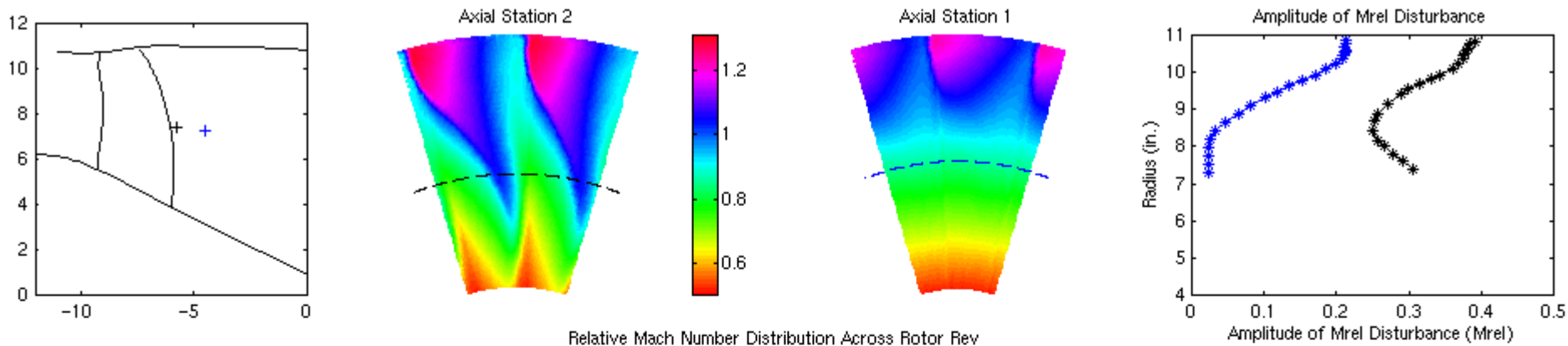
Relative Mach Number Distribution Across Rotor Rev

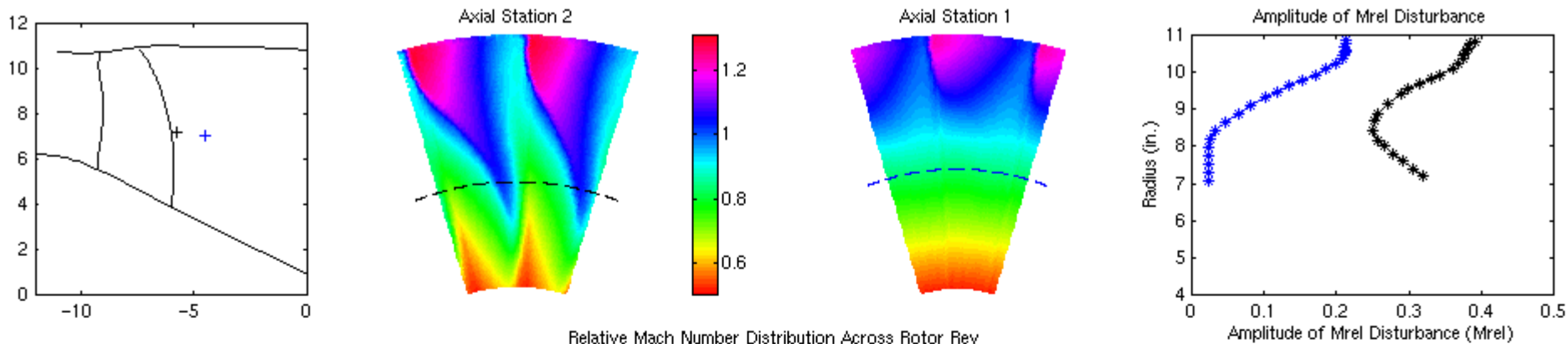




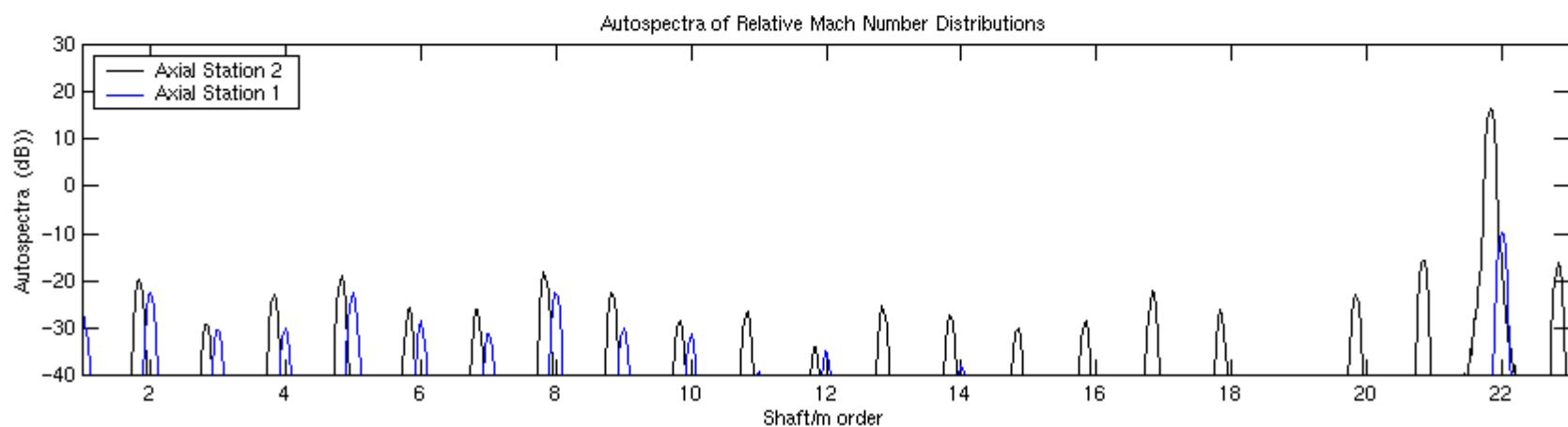
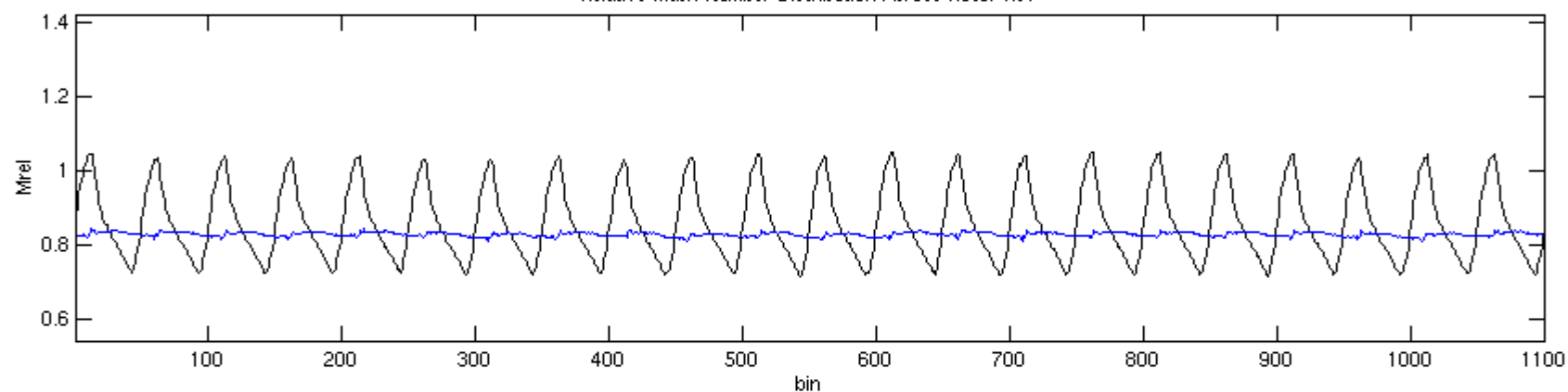
Relative Mach Number Distribution Across Rotor Rev

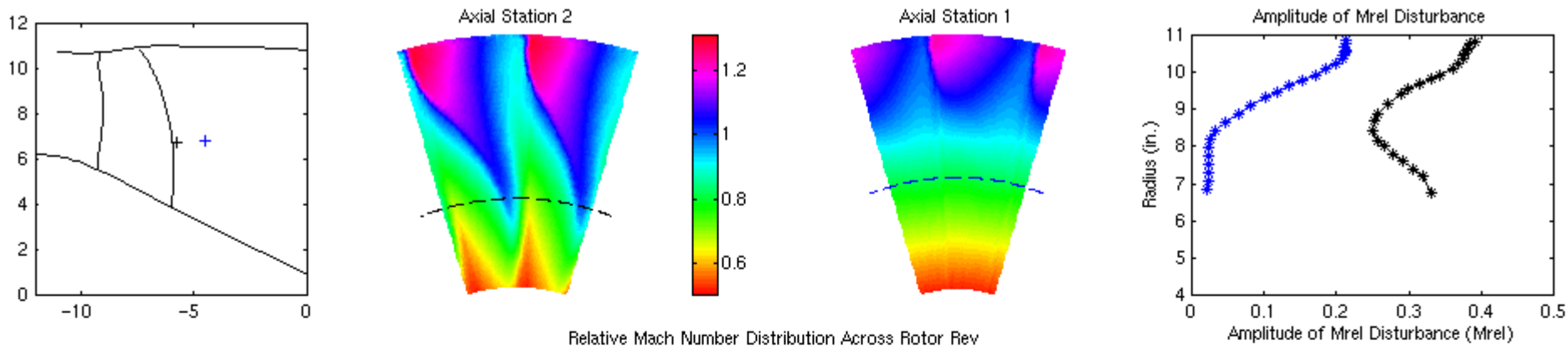




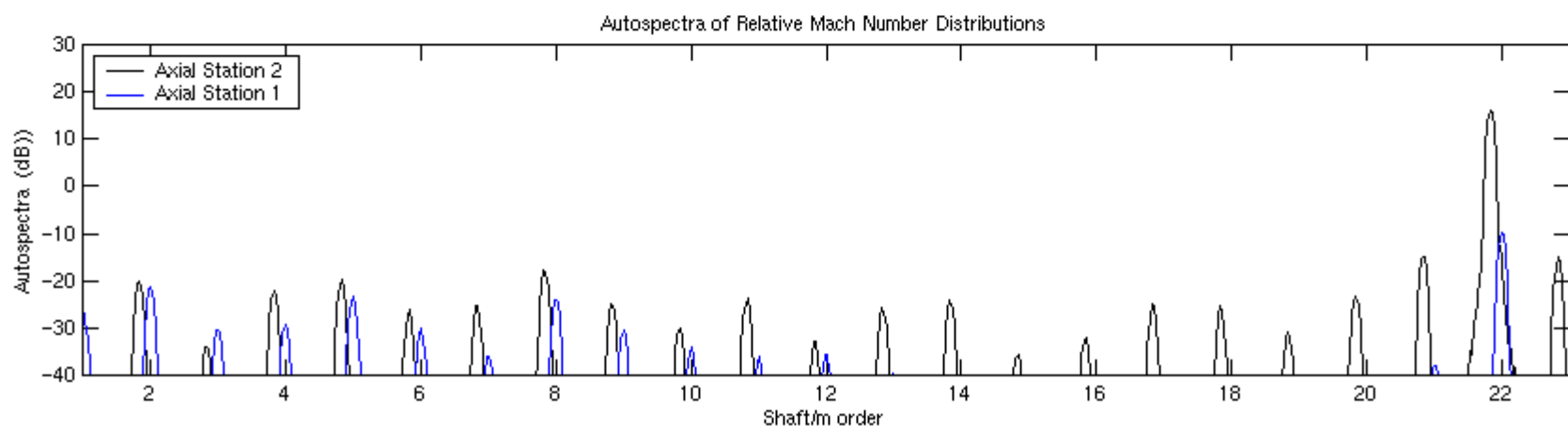
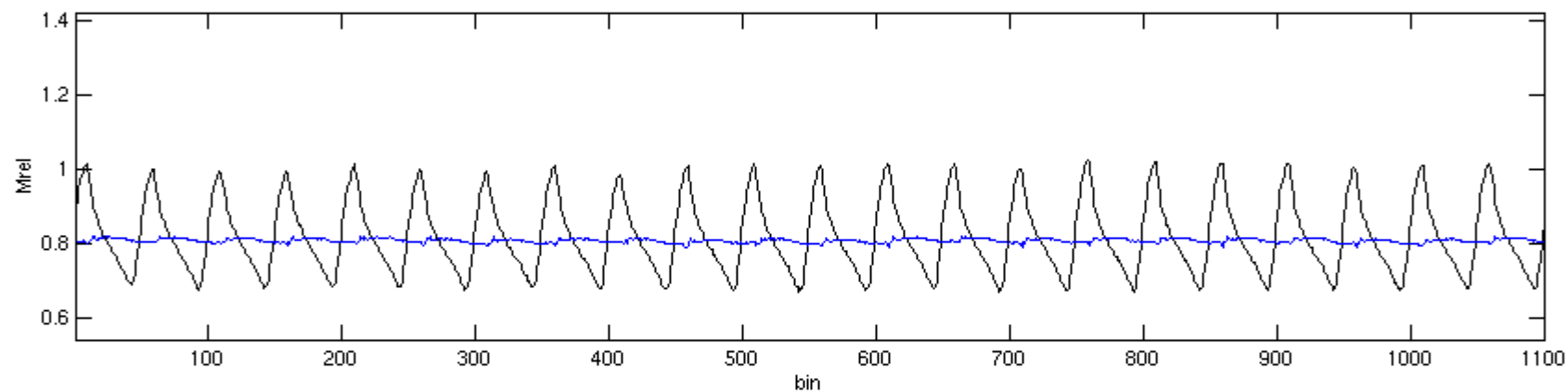


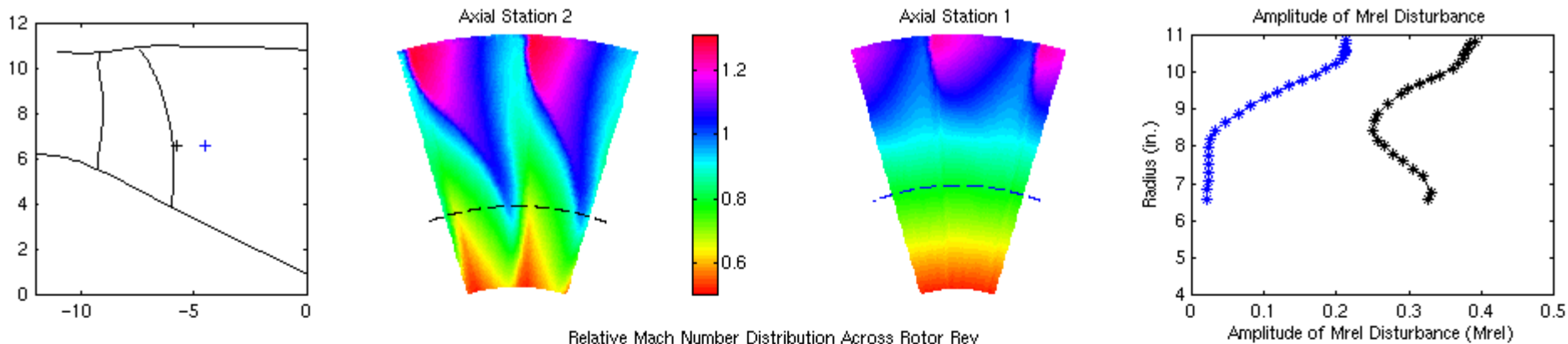
Relative Mach Number Distribution Across Rotor Rev



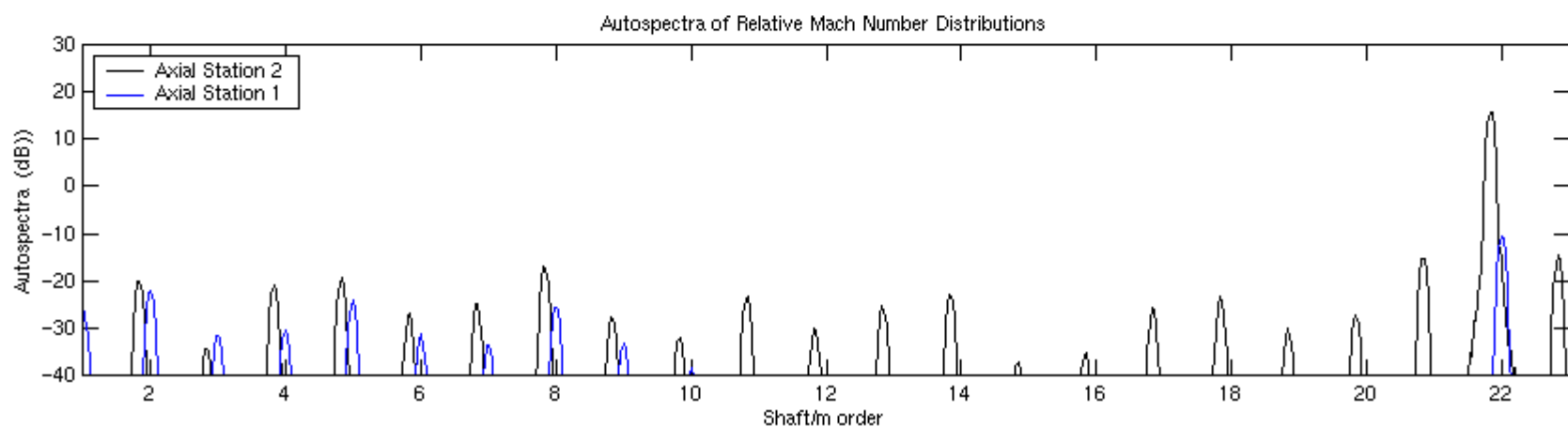
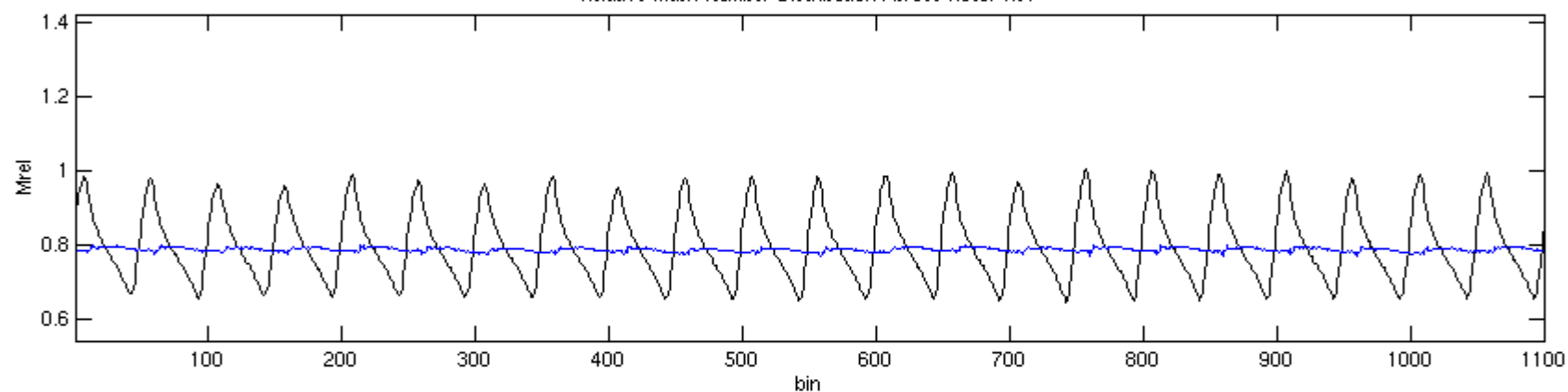


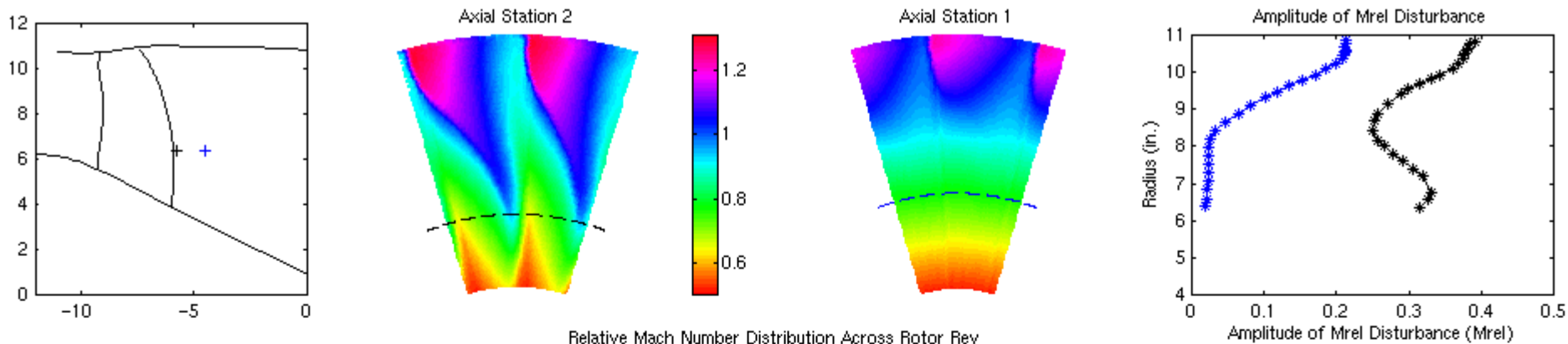
Relative Mach Number Distribution Across Rotor Rev



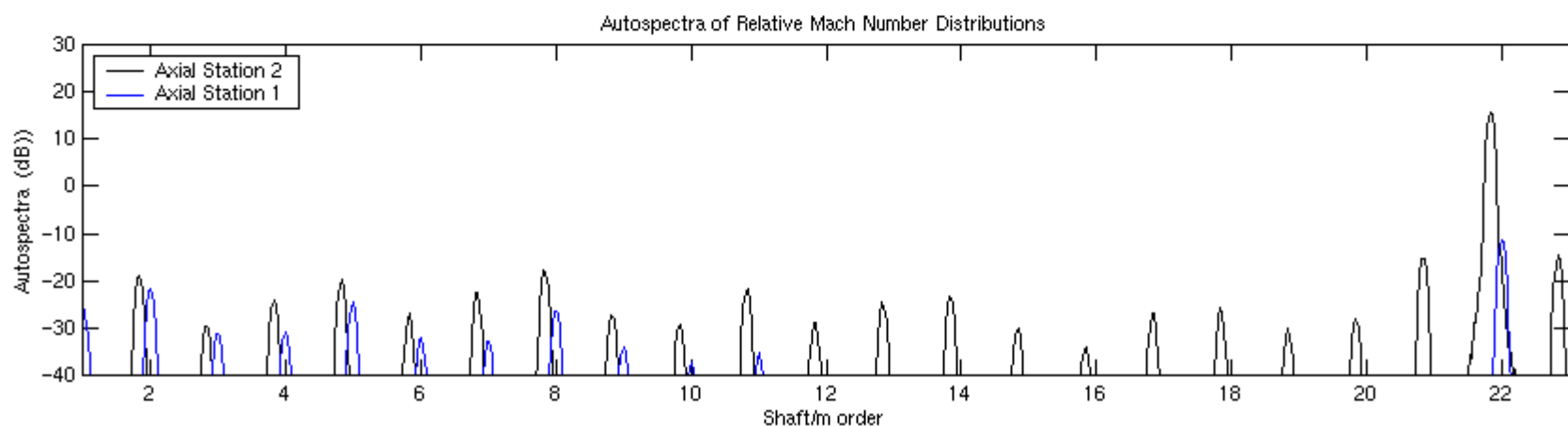
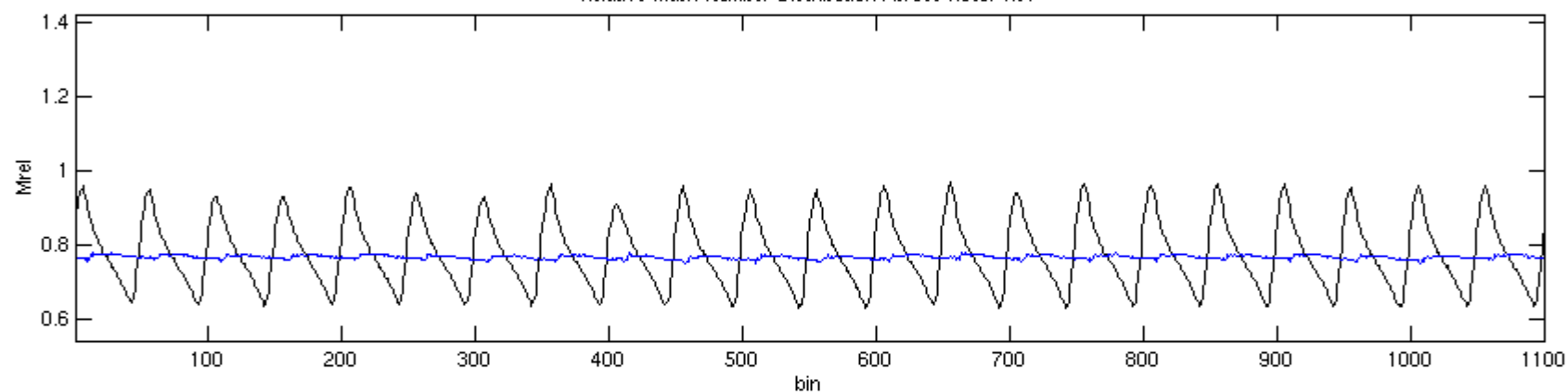


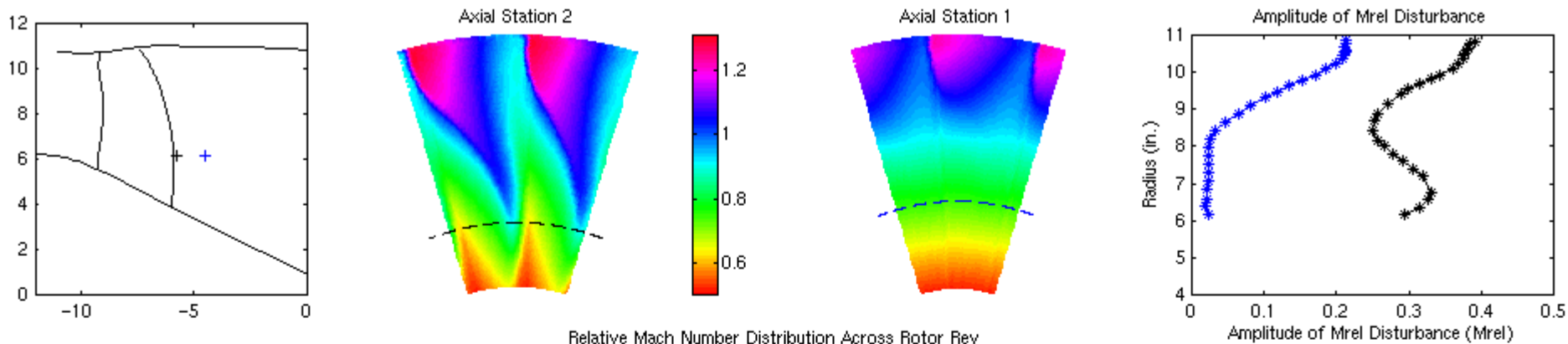
Relative Mach Number Distribution Across Rotor Rev



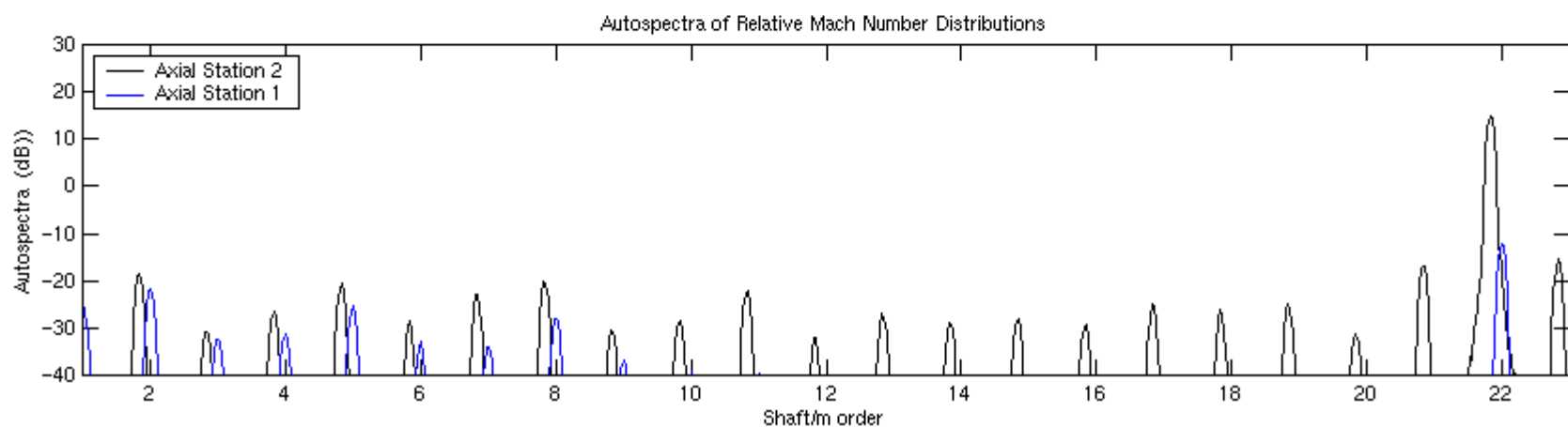
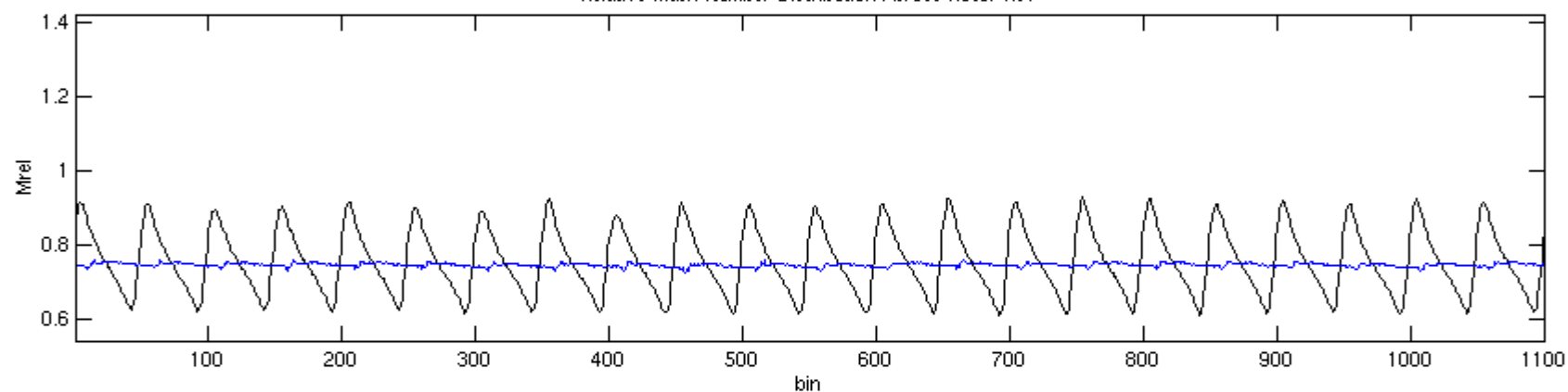


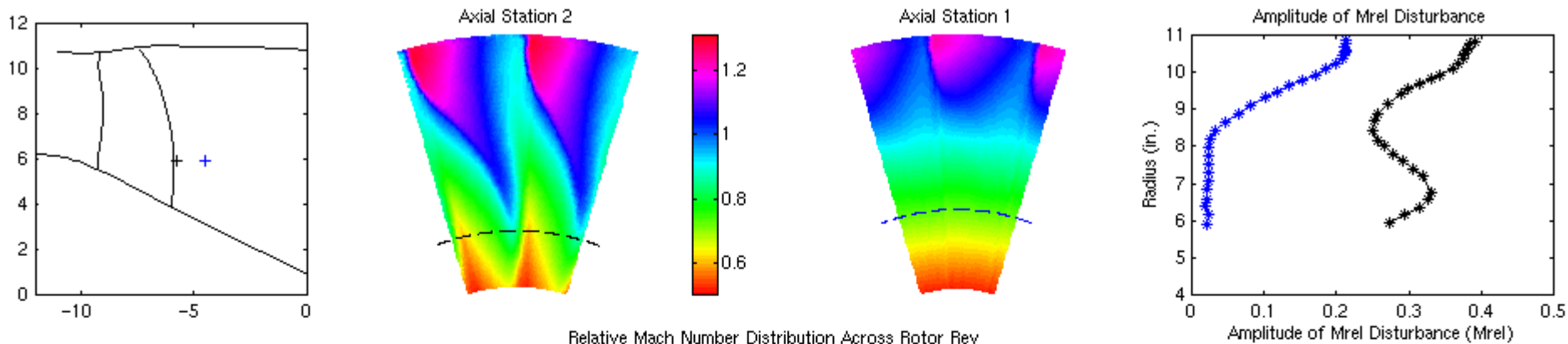
Relative Mach Number Distribution Across Rotor Rev



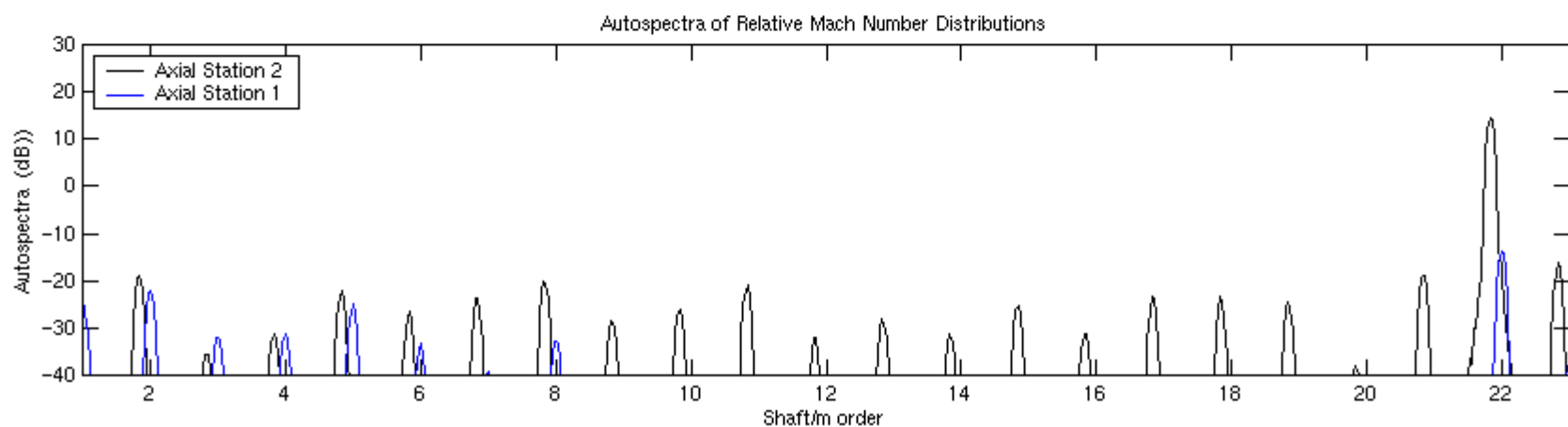
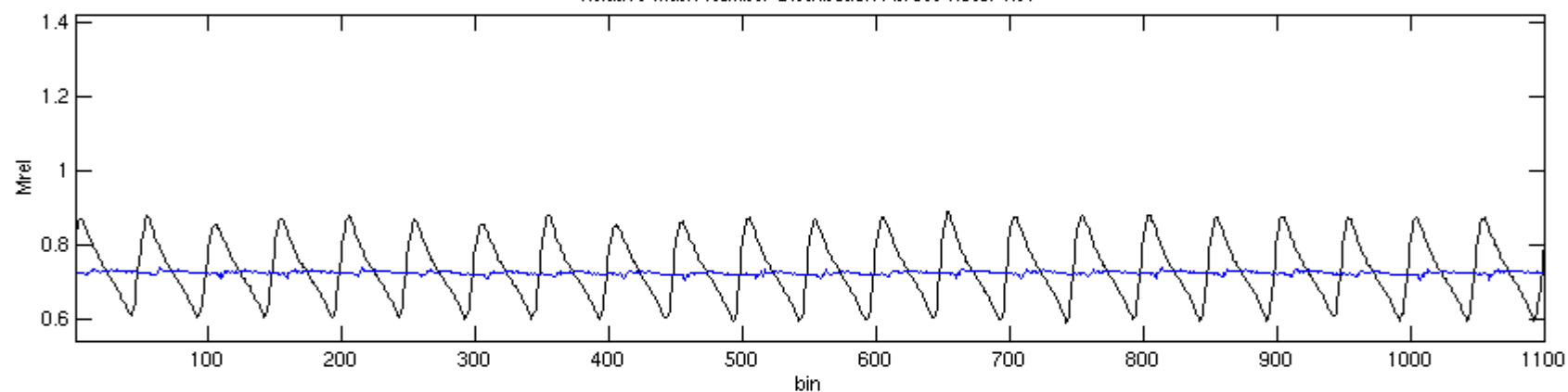


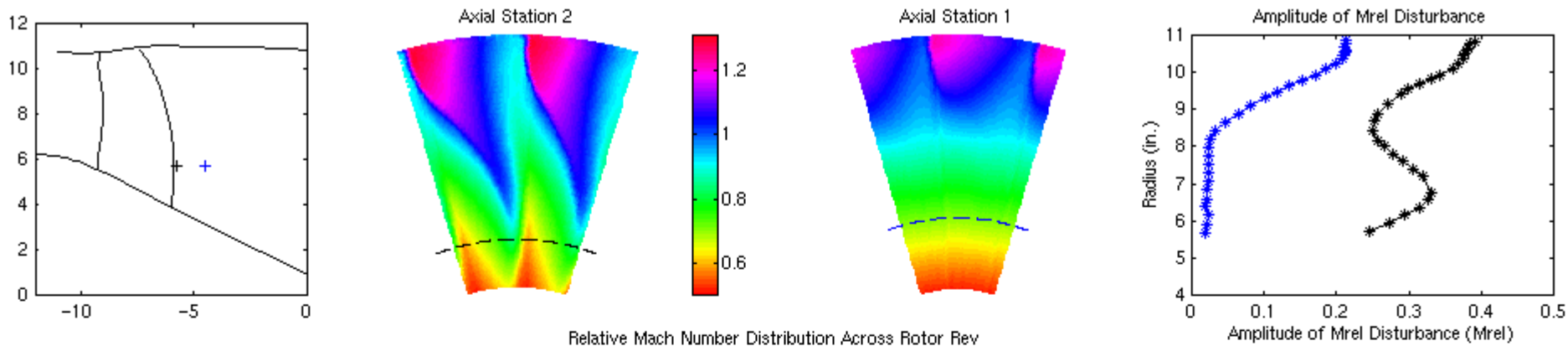
Relative Mach Number Distribution Across Rotor Rev



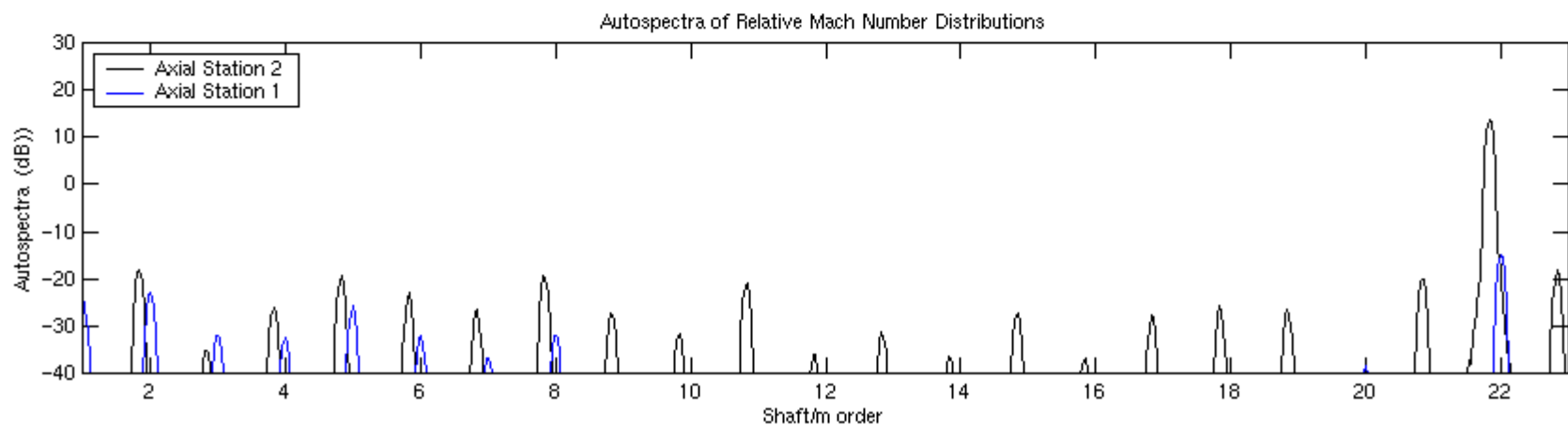
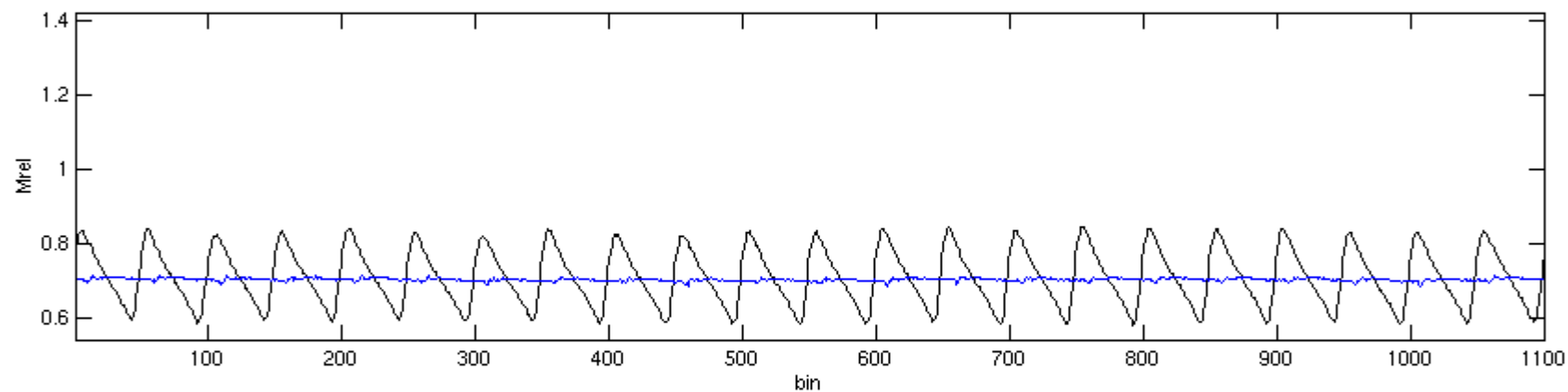


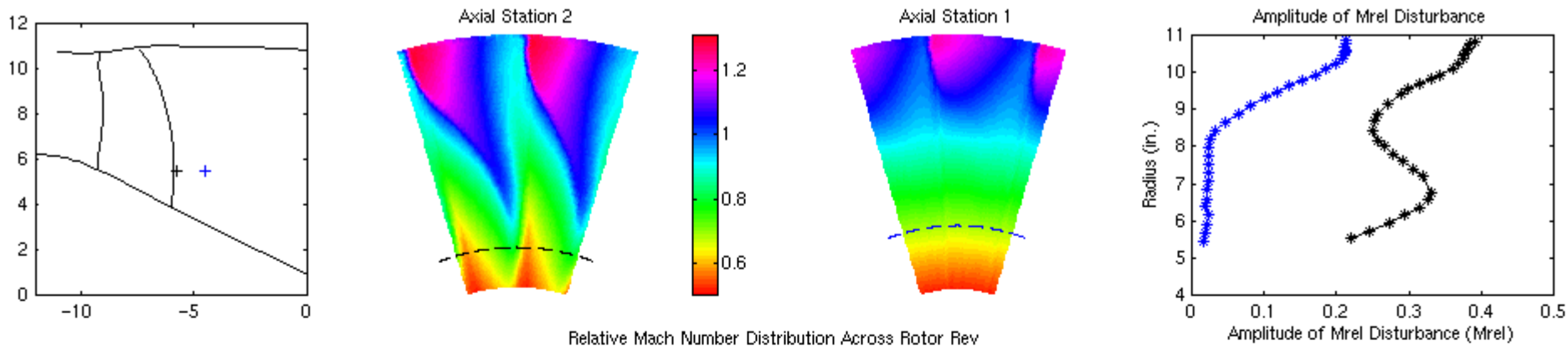
Relative Mach Number Distribution Across Rotor Rev



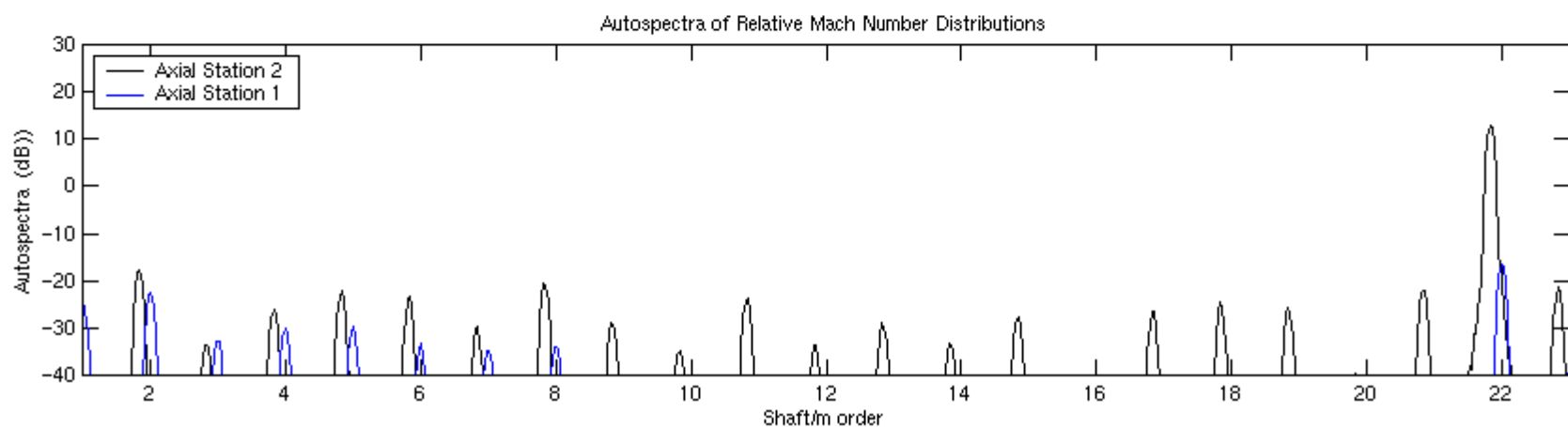
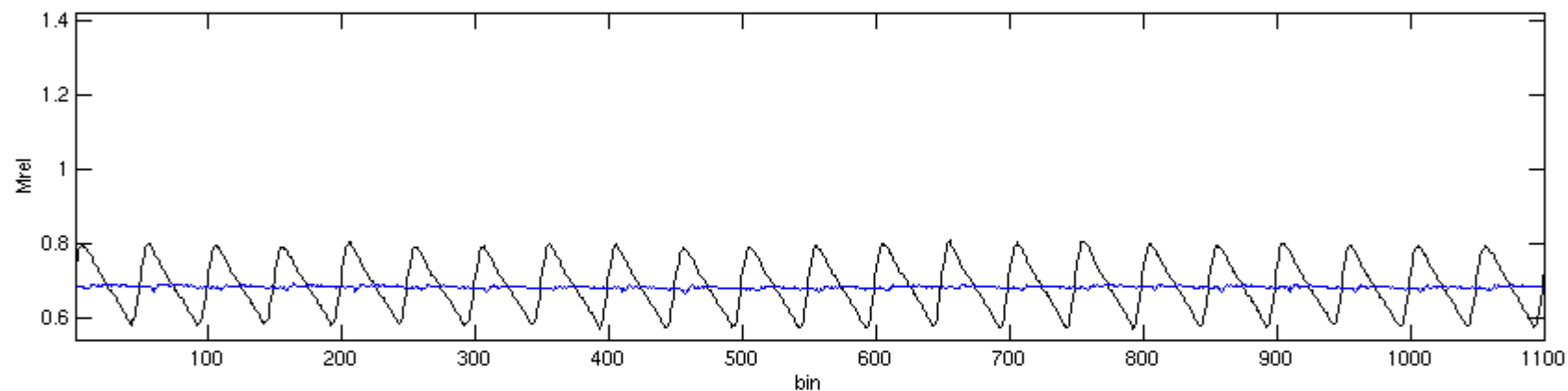


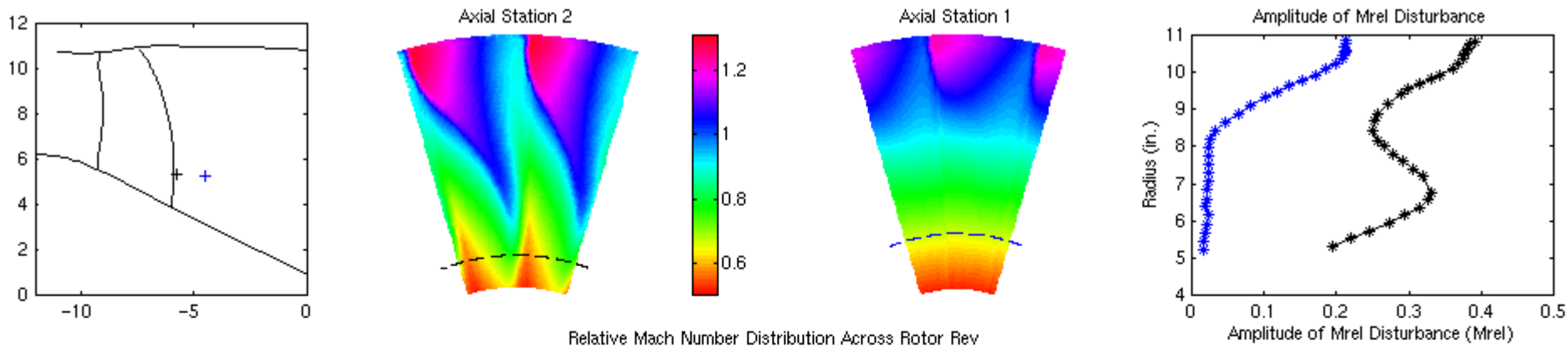
Relative Mach Number Distribution Across Rotor Rev



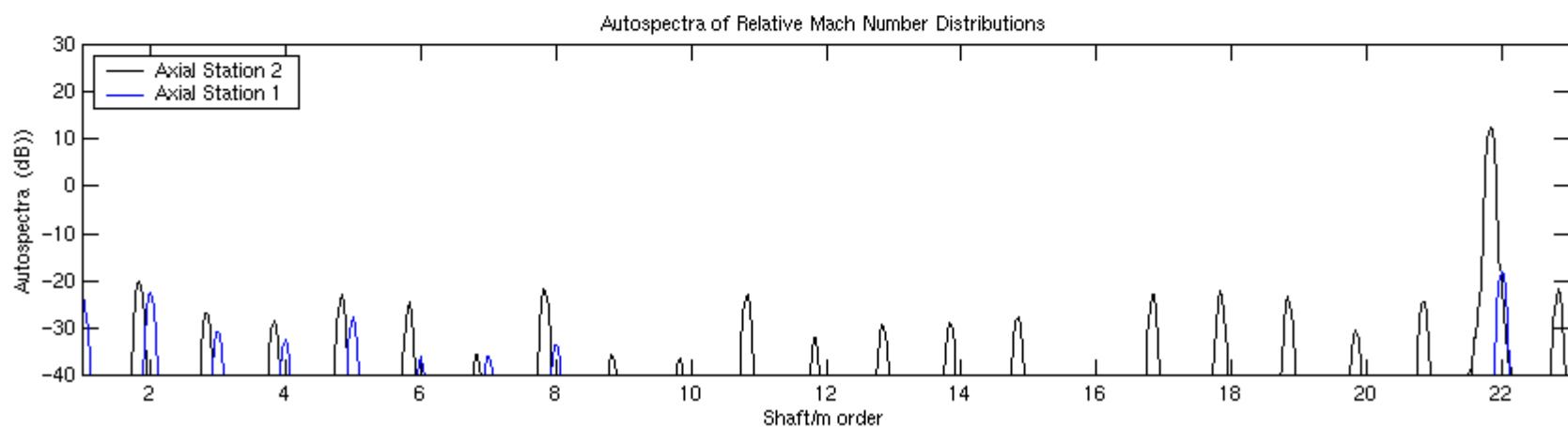
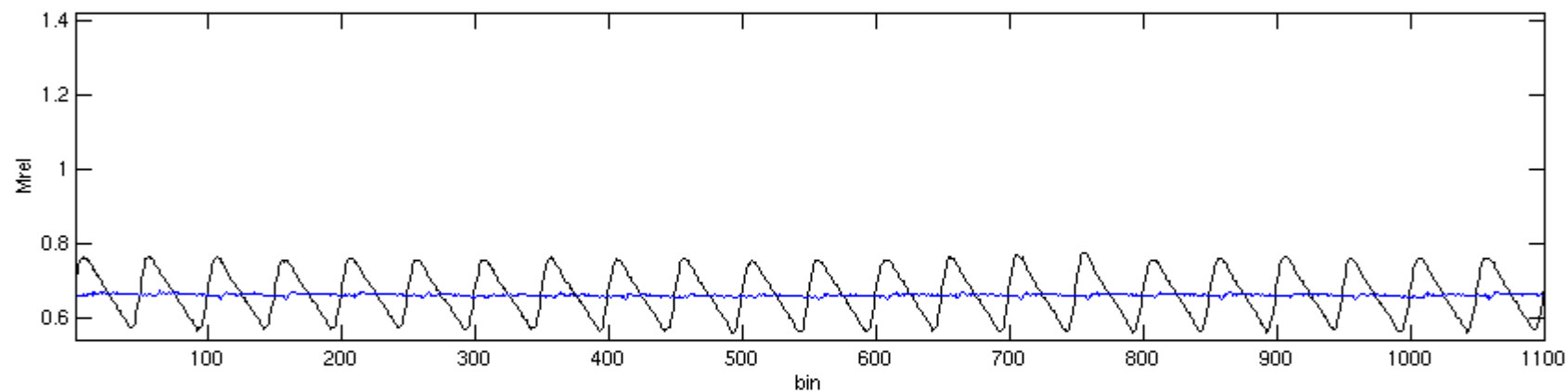


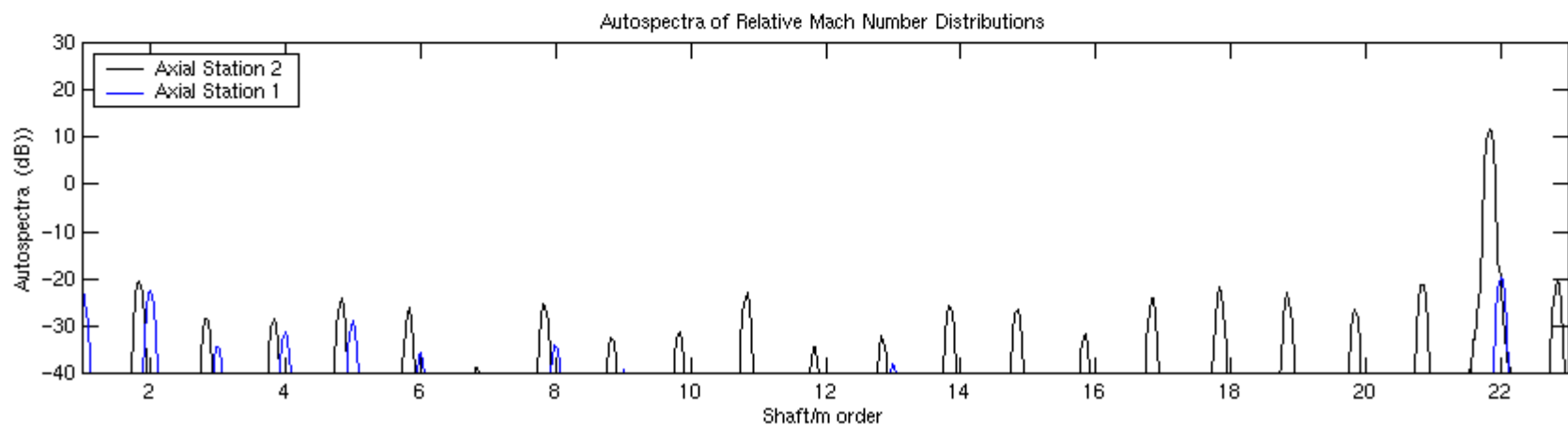
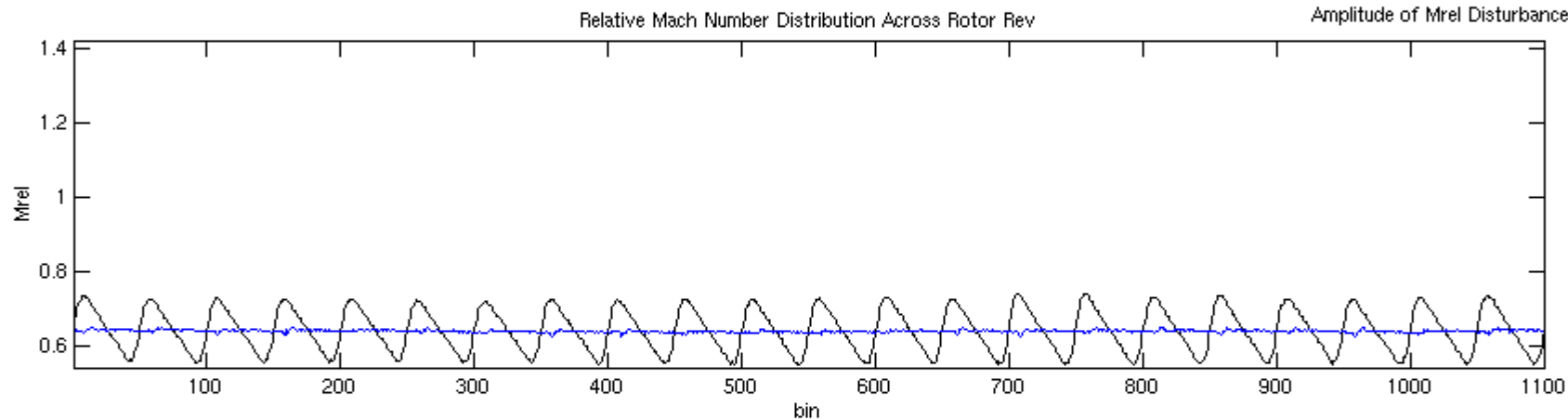
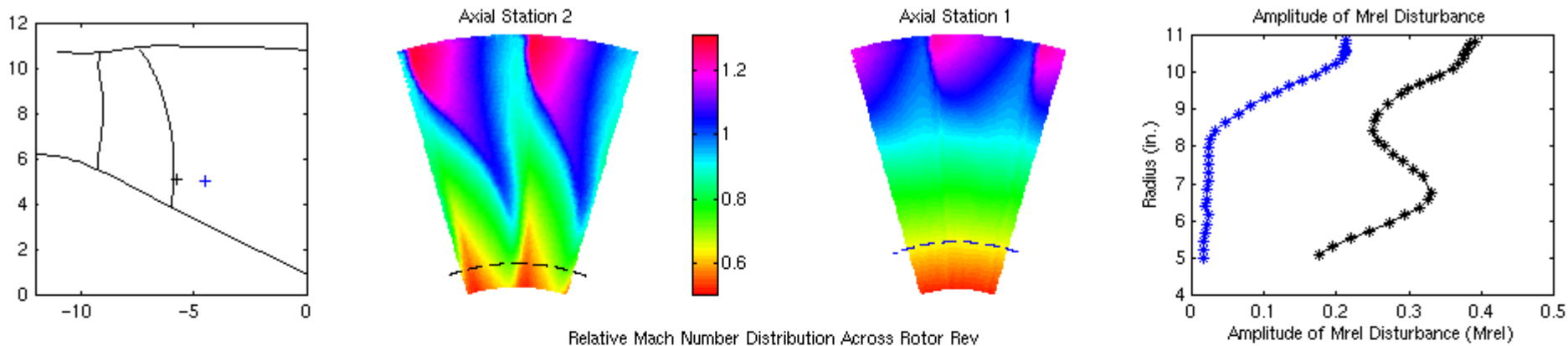
Relative Mach Number Distribution Across Rotor Rev

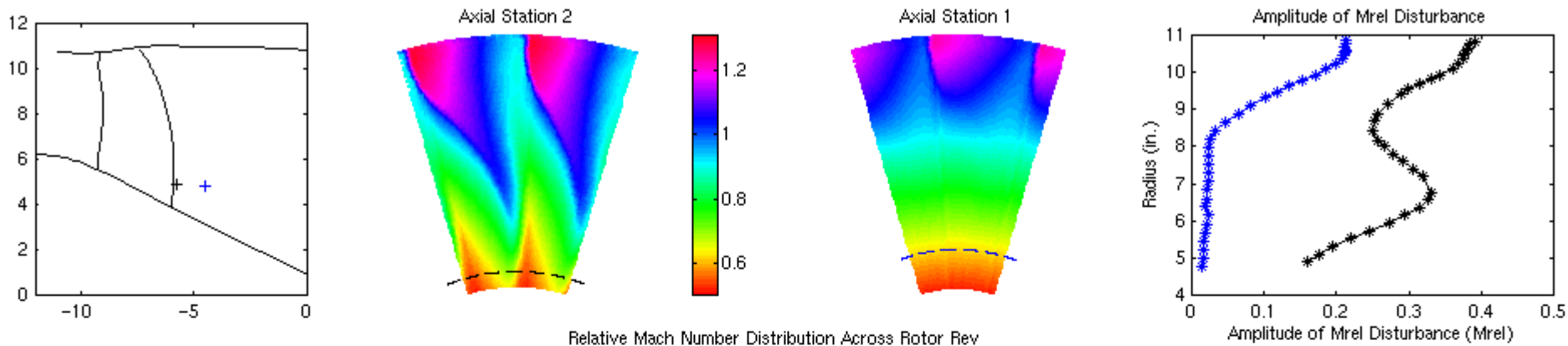




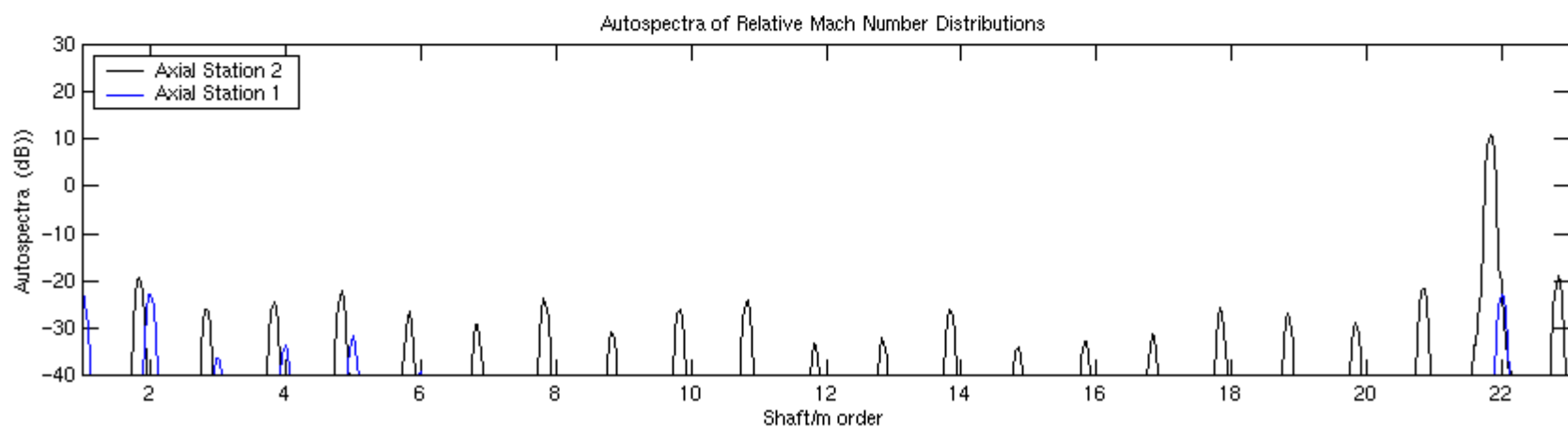
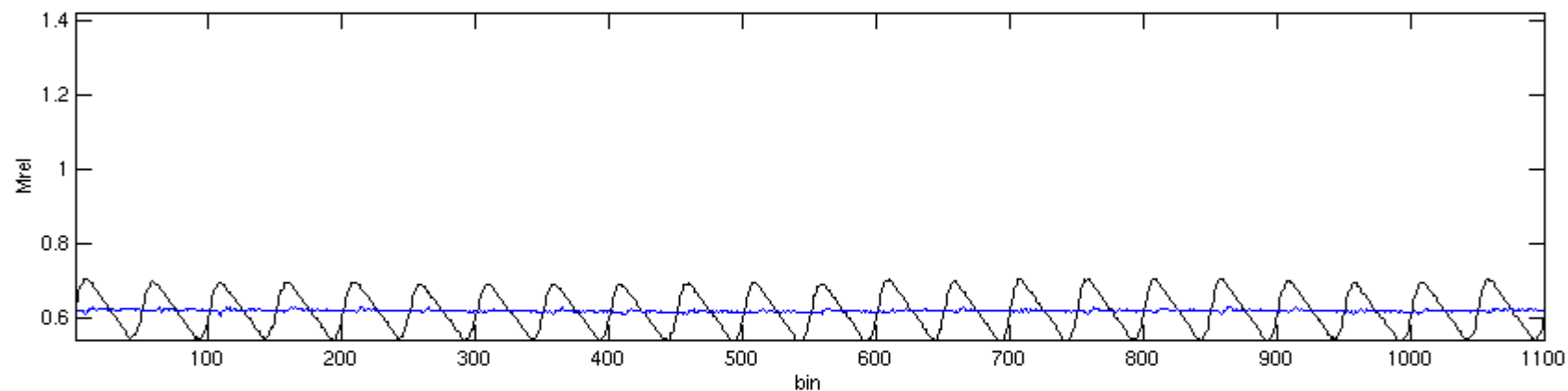
Relative Mach Number Distribution Across Rotor Rev

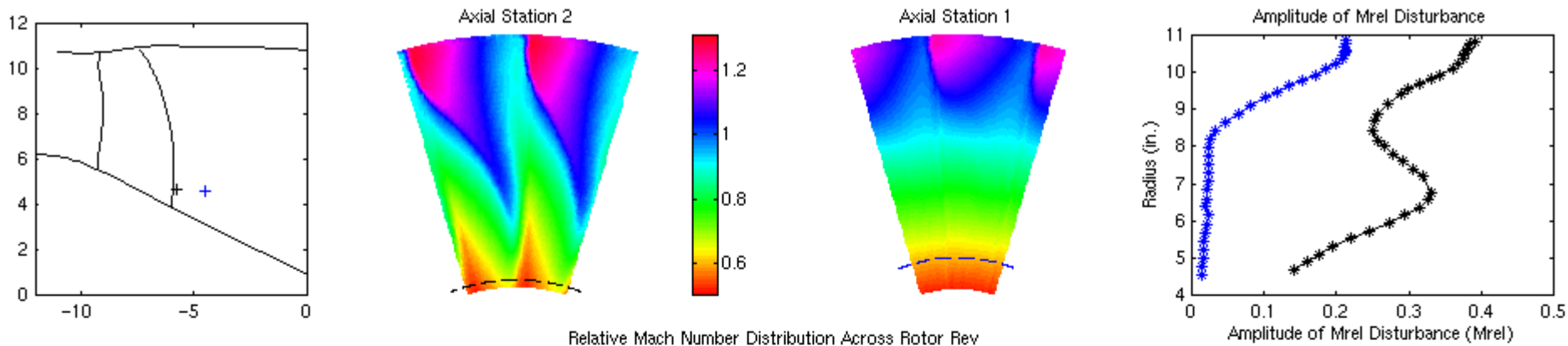




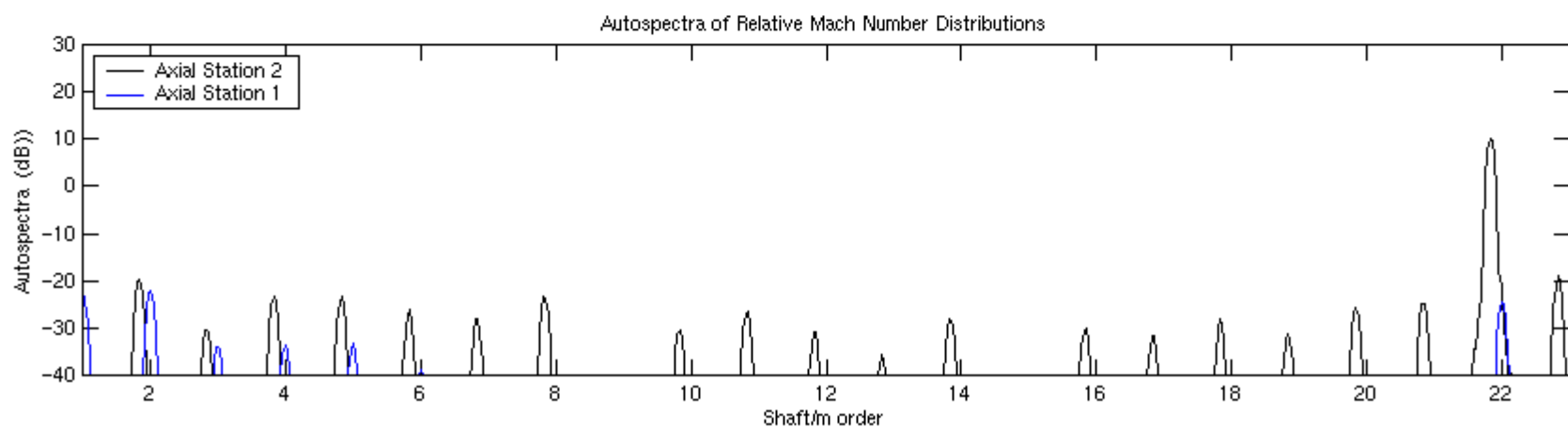
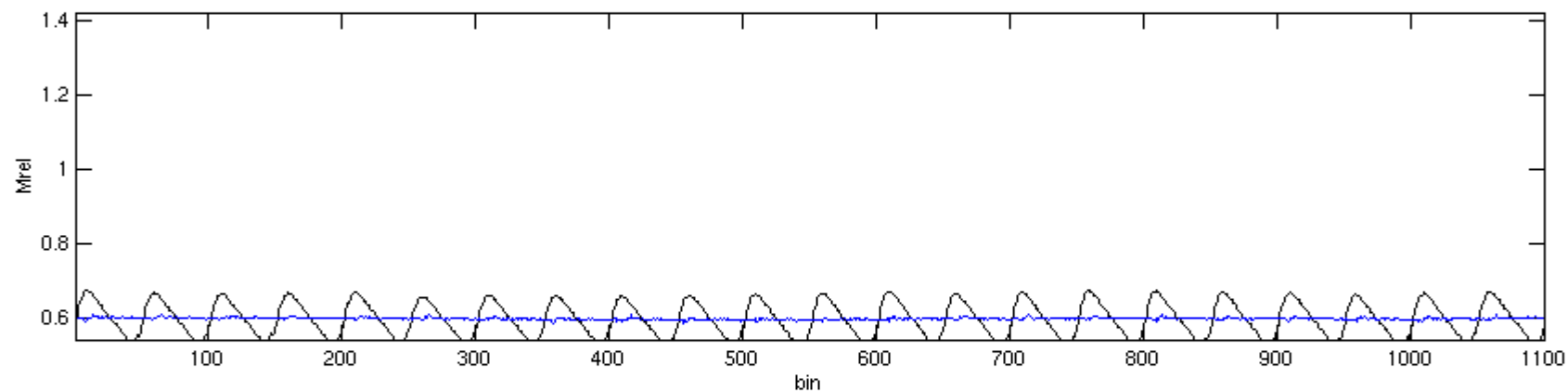


Relative Mach Number Distribution Across Rotor Rev





Relative Mach Number Distribution Across Rotor Rev



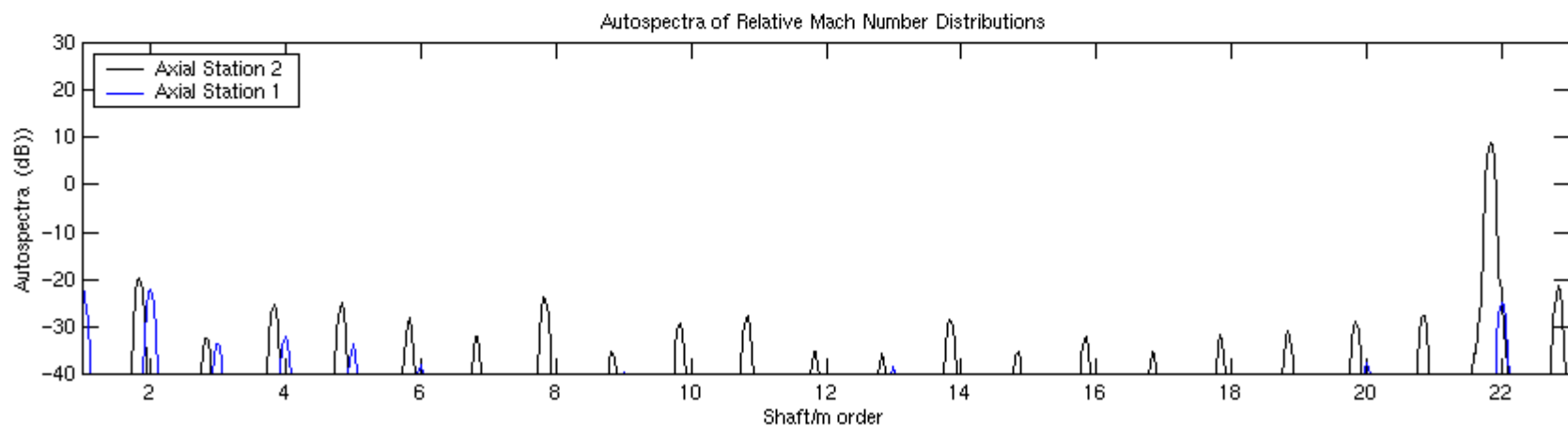
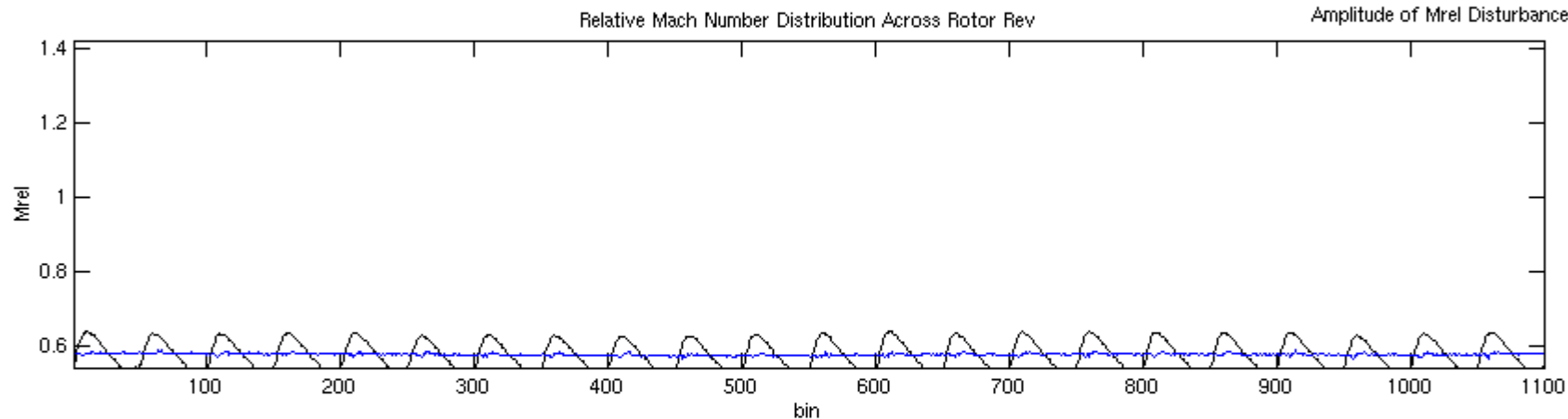
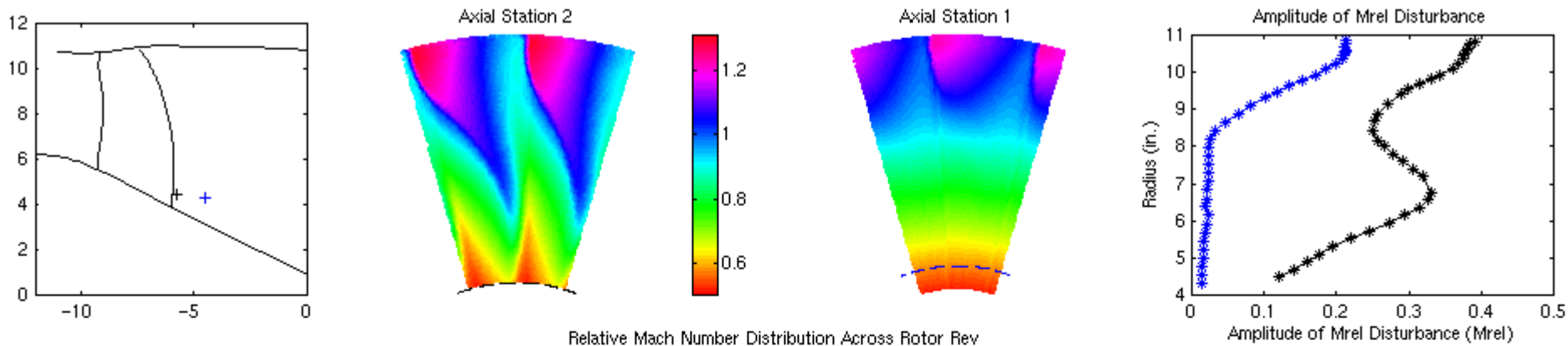


Figure 24.—Variation in the average amplitude of the disturbance measured upstream of the aft-swept fan with distance upstream of the leading edge.

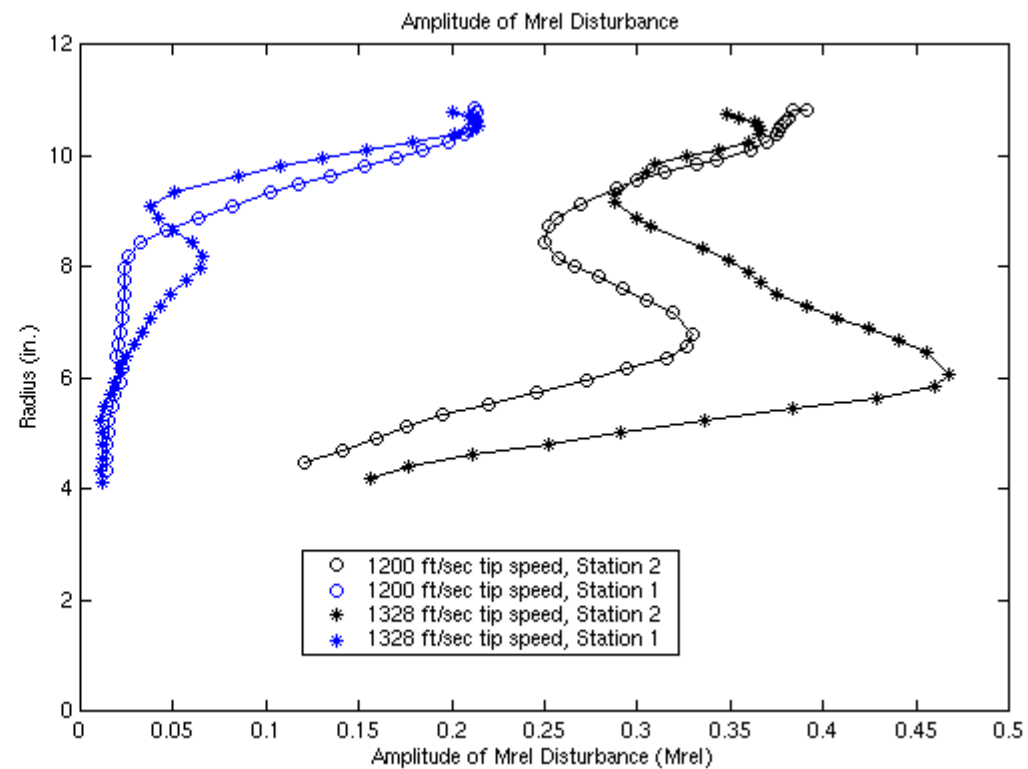
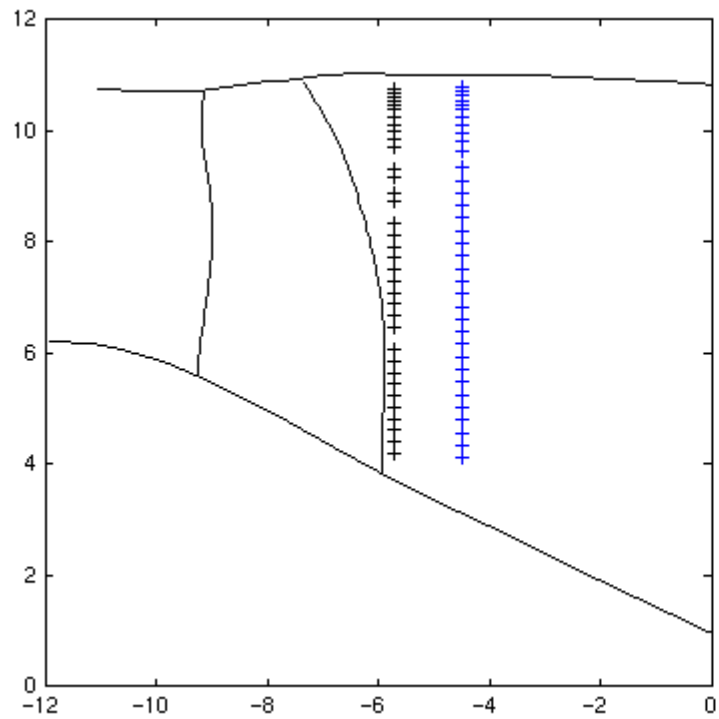
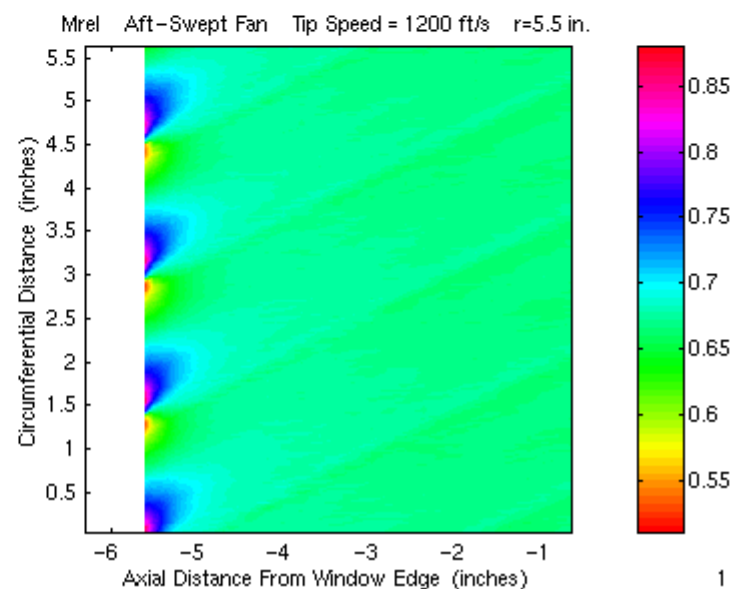
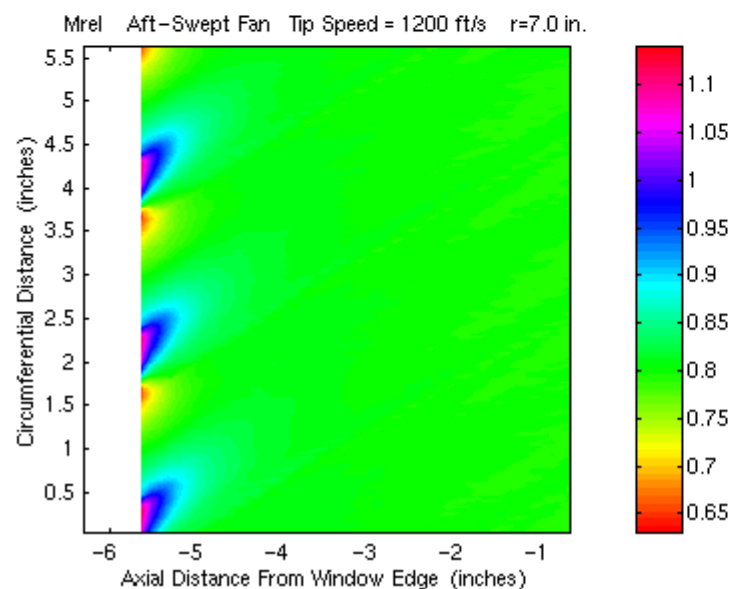
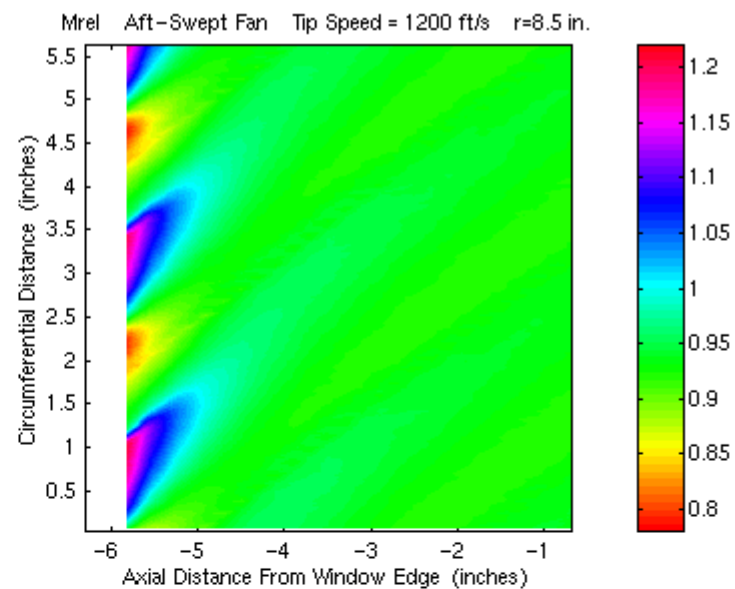
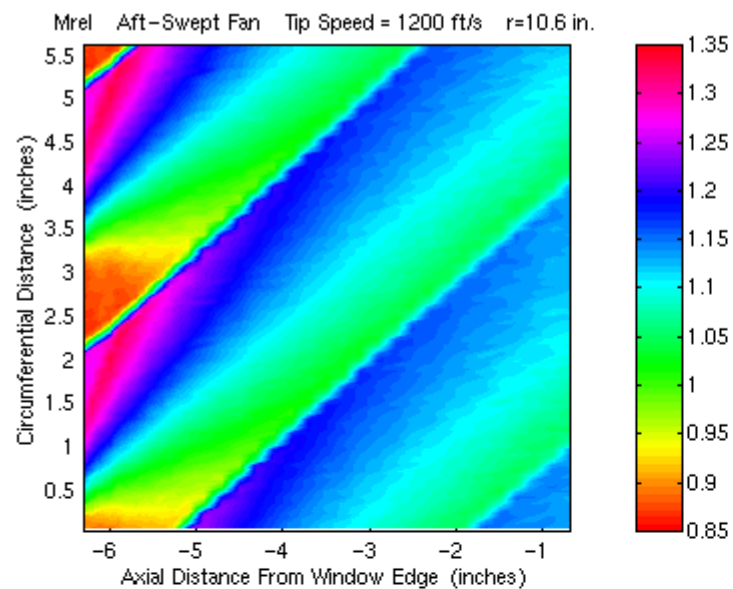
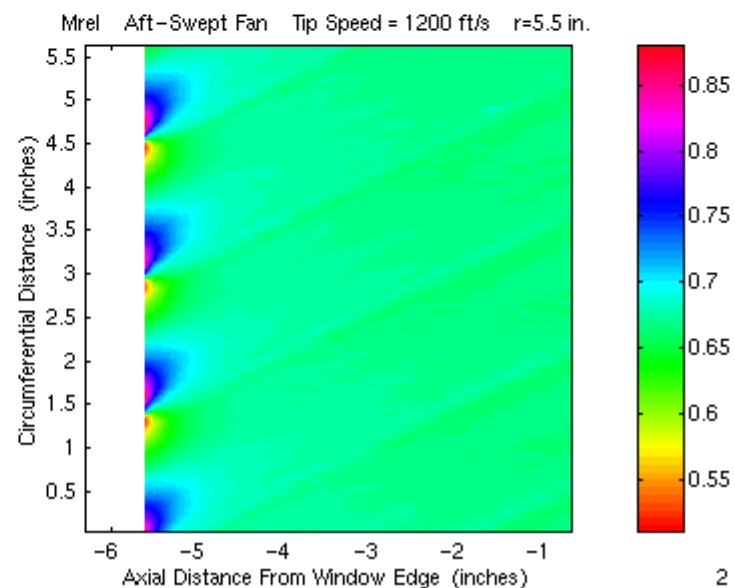
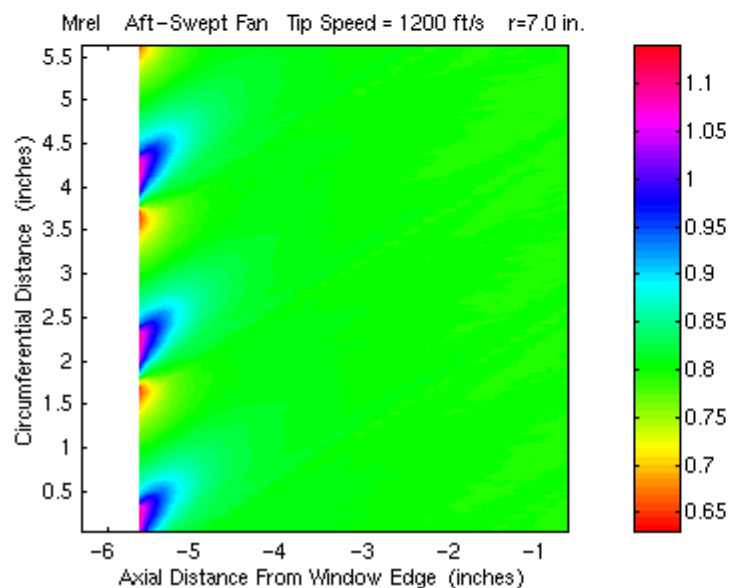
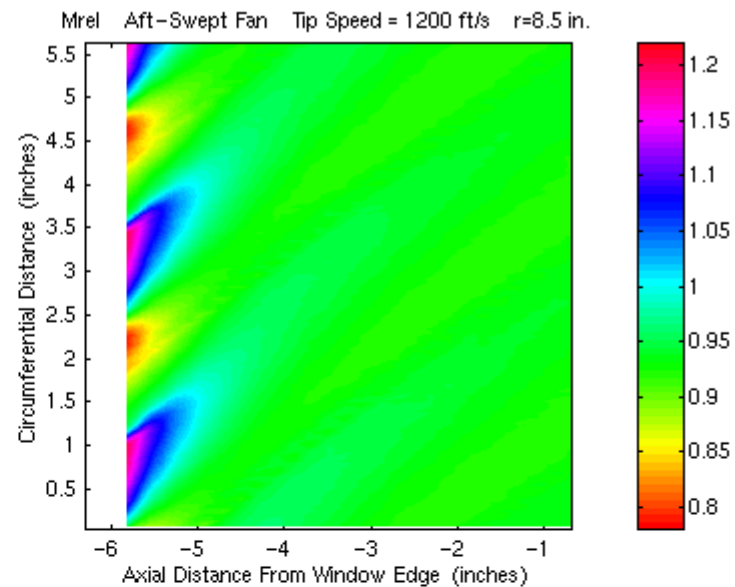
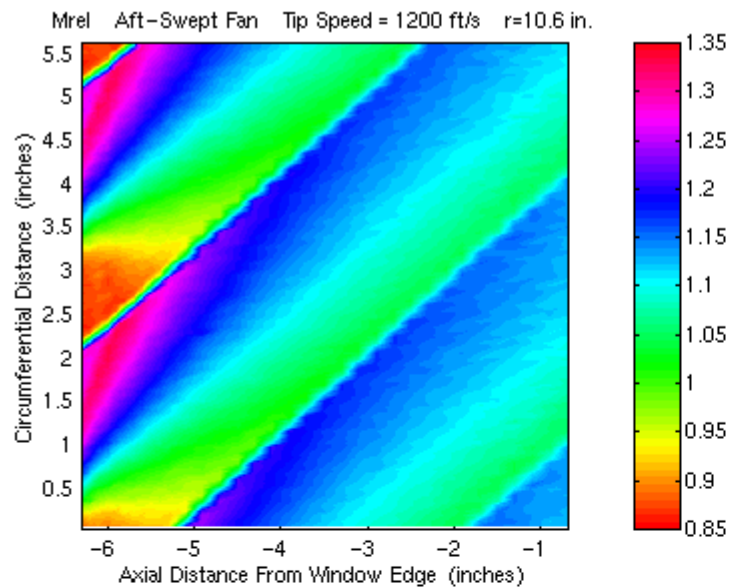
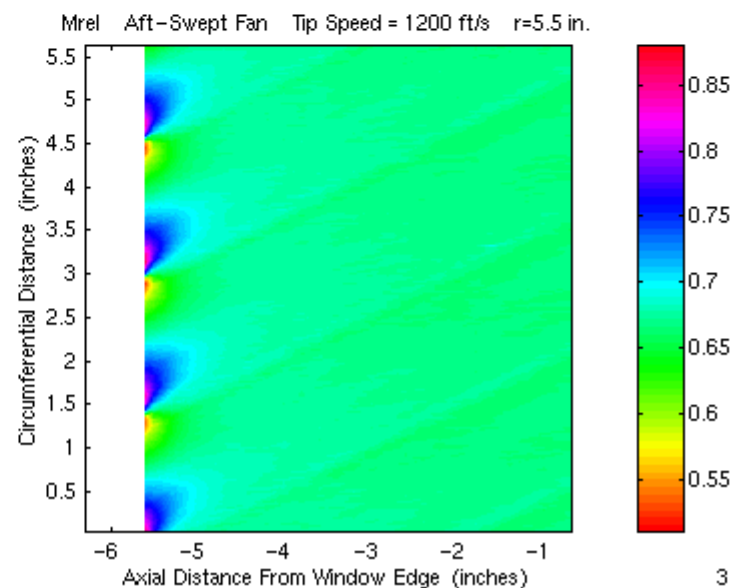
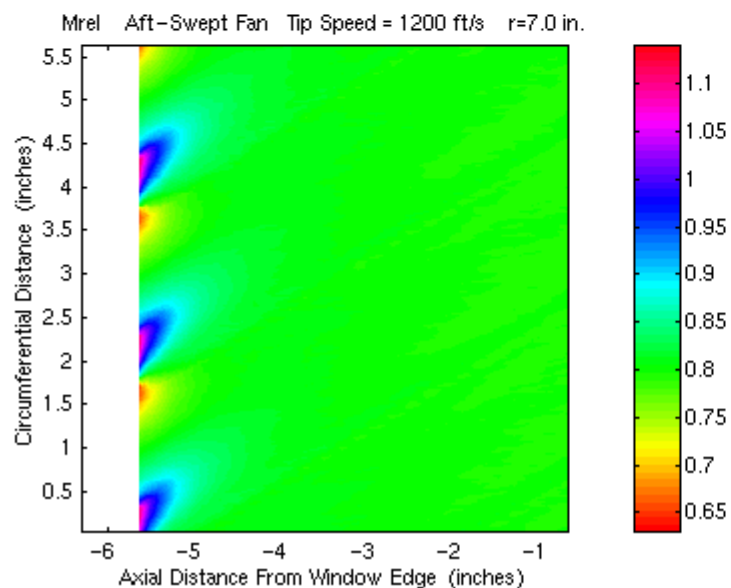
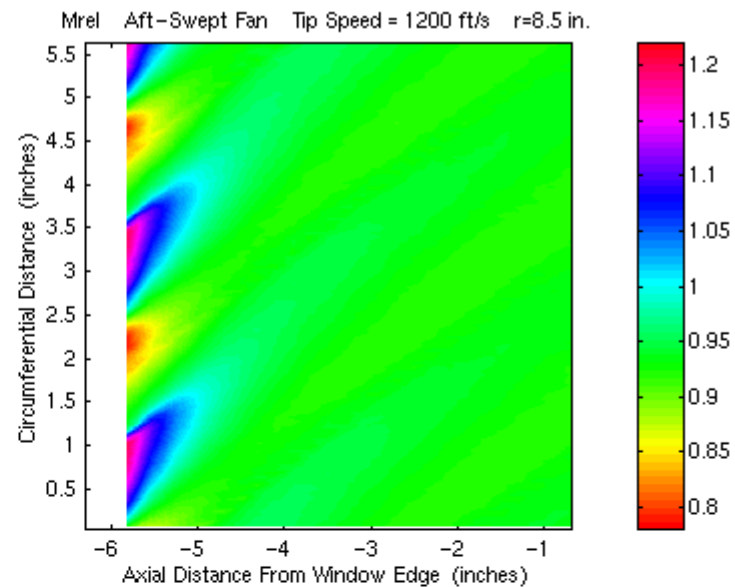
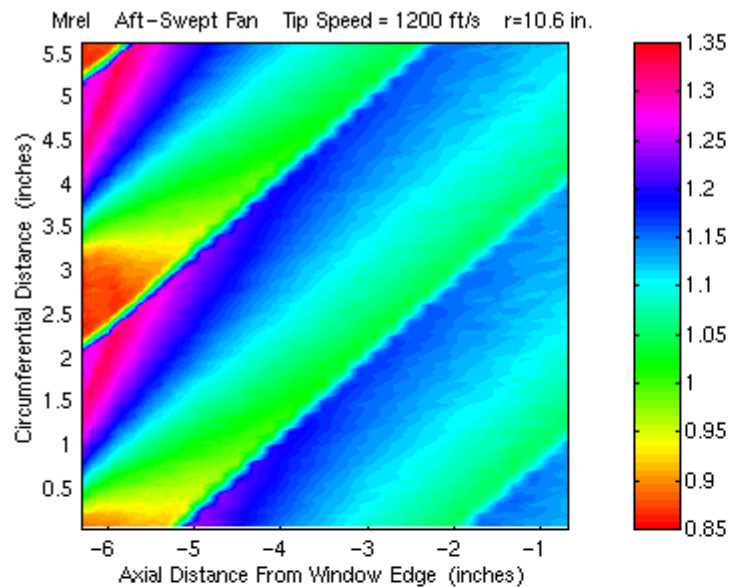
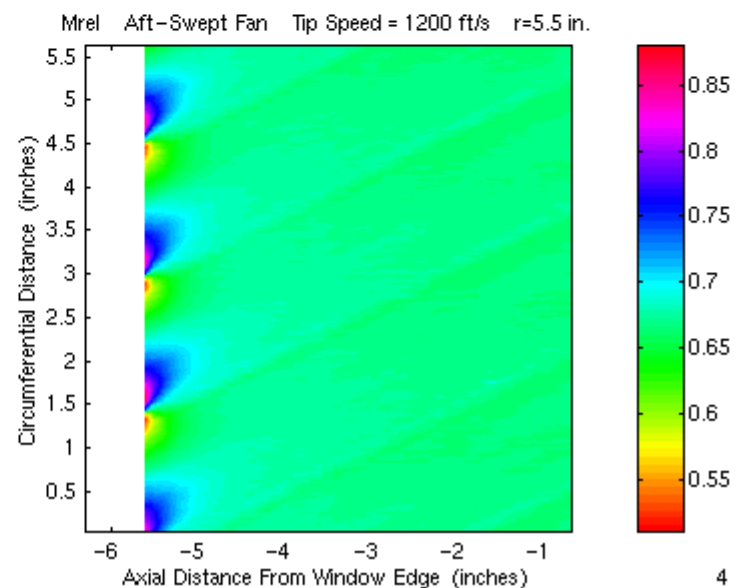
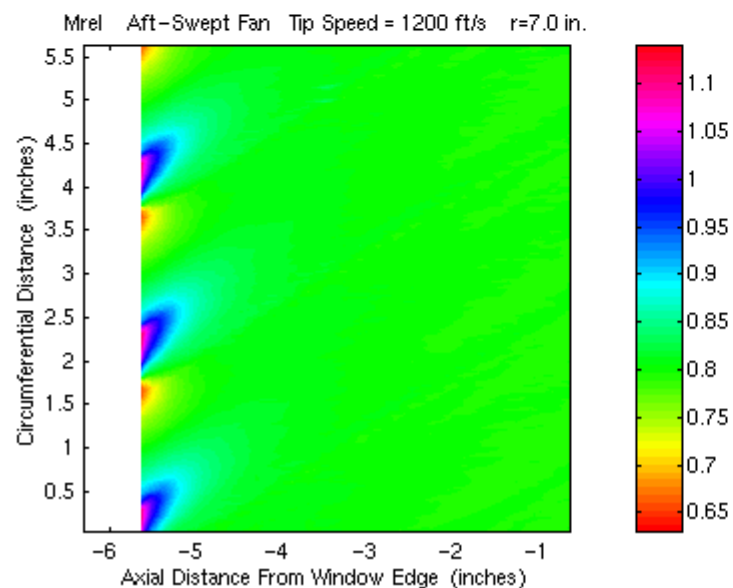
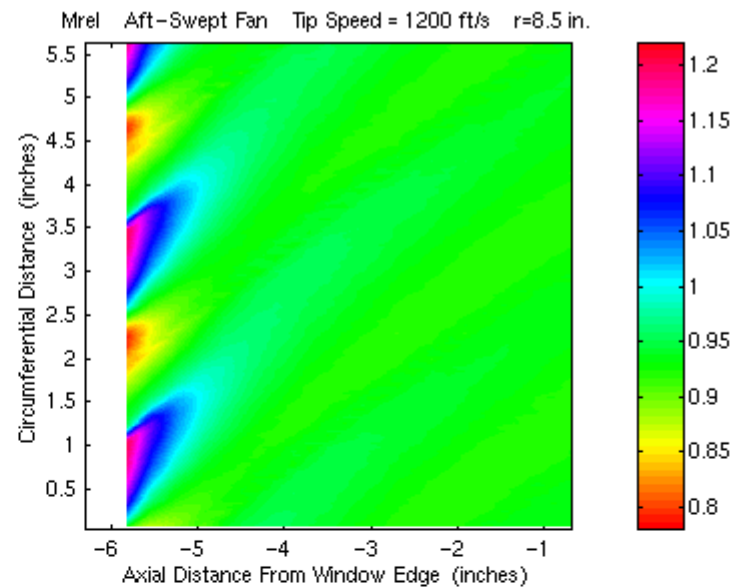
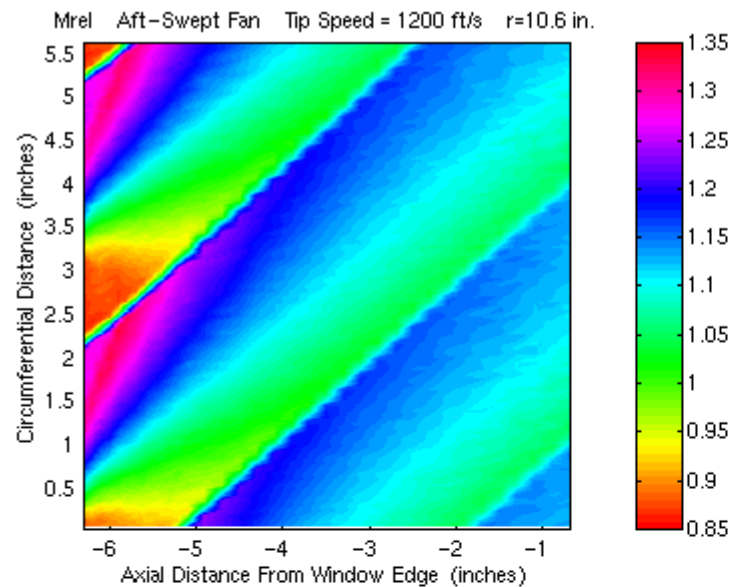


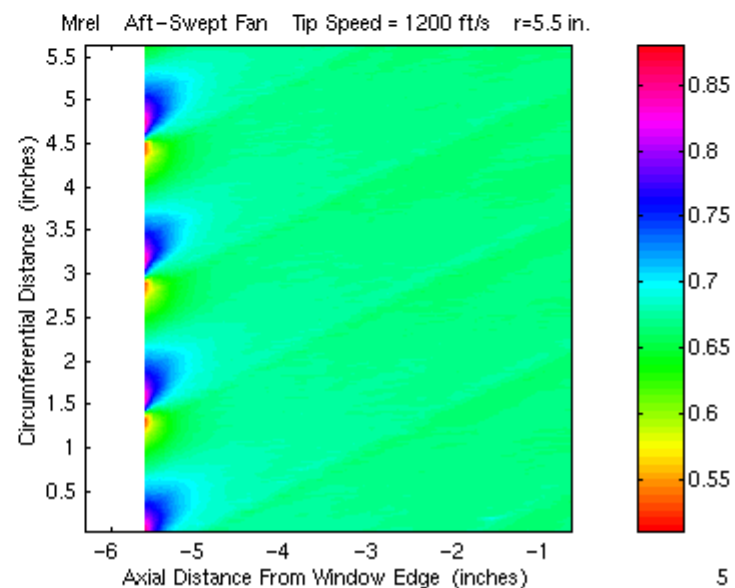
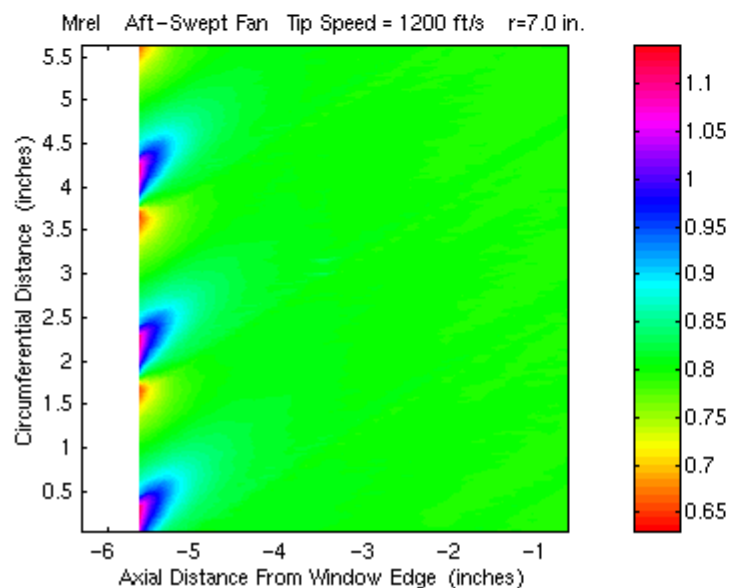
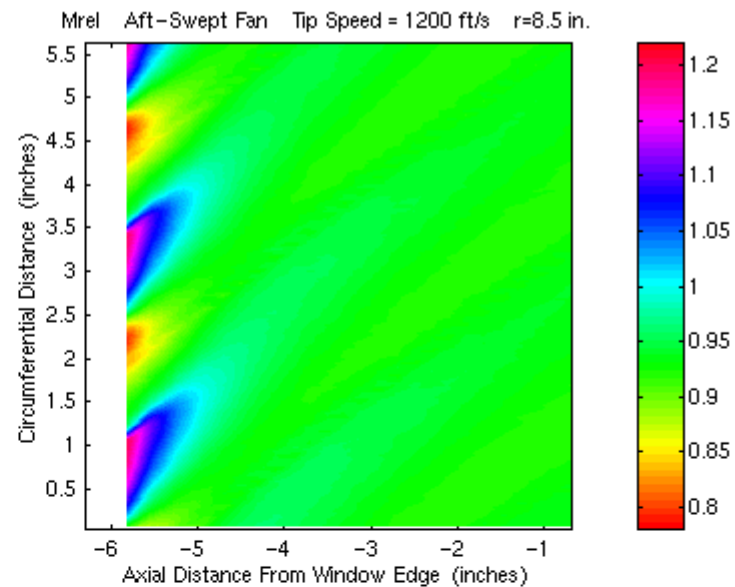
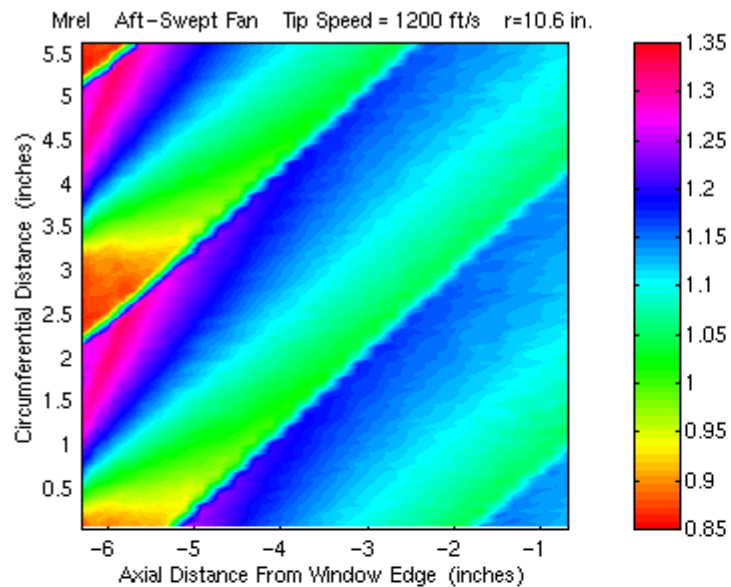
Figure 28.—Slideshow (22 slides) illustrating the blade-to-blade variations in the flow measured upstream of the aft-swept fan at $r = 10.6, 8.5, 7.0$ and 5.5 inches with the rotor operating at the mid-speed condition.

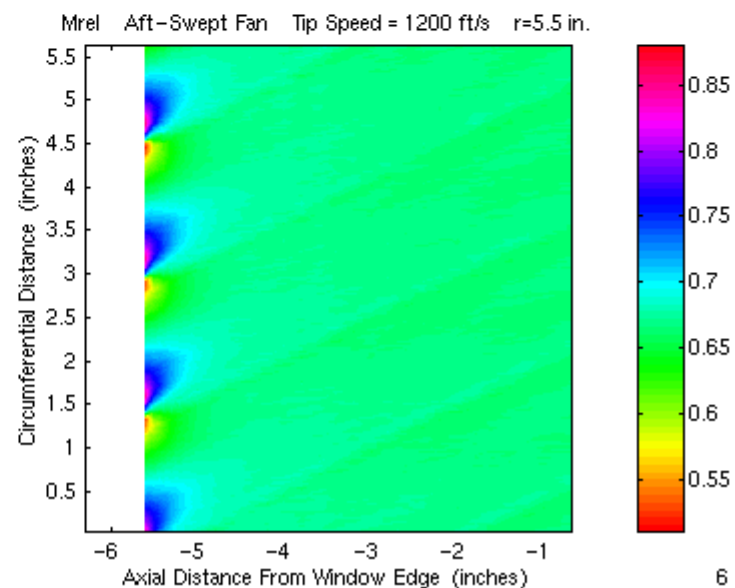
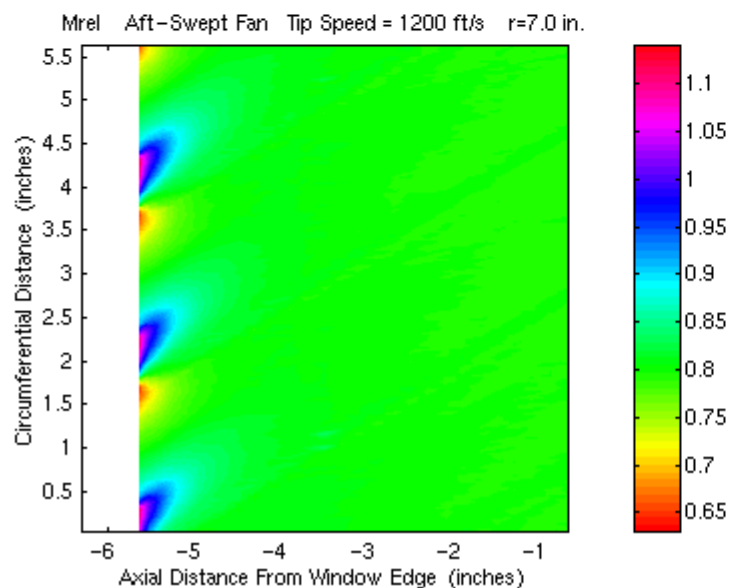
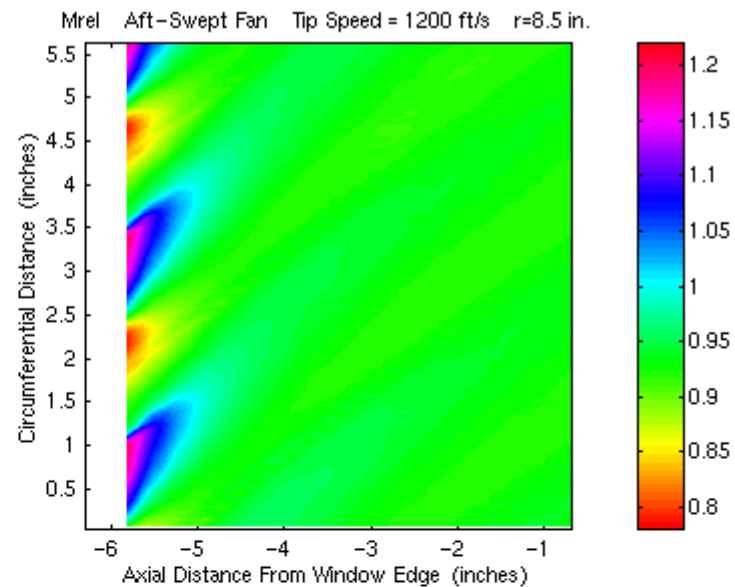
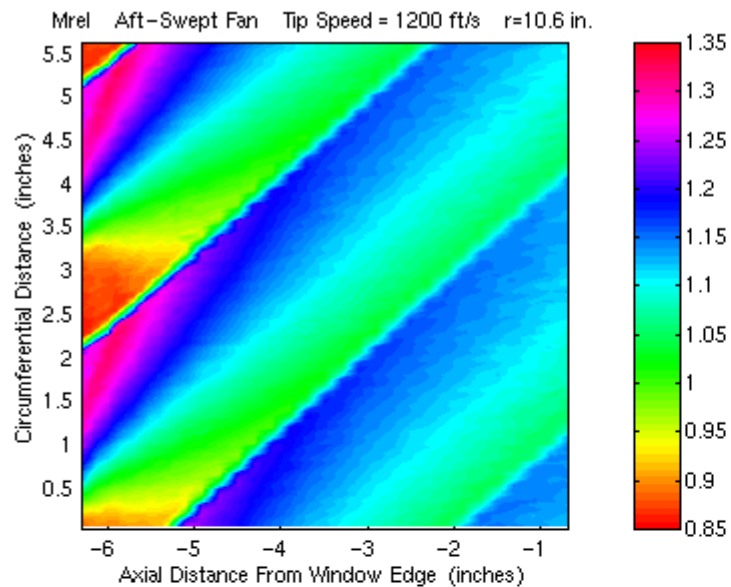


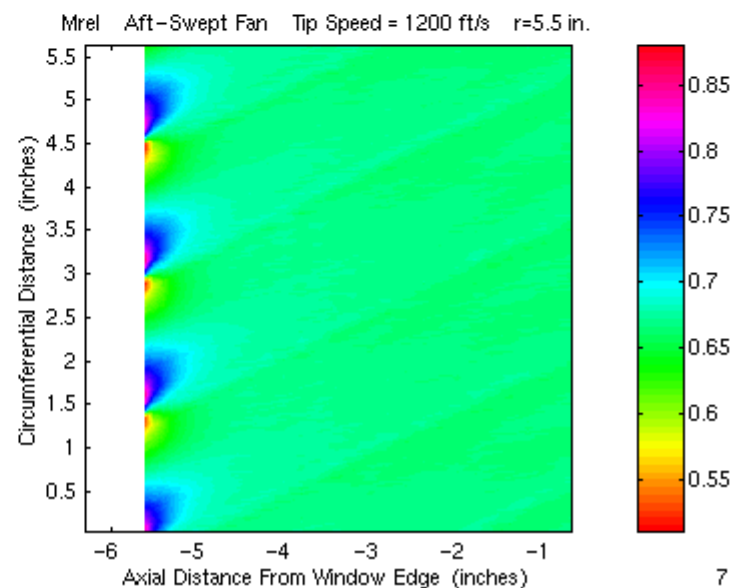
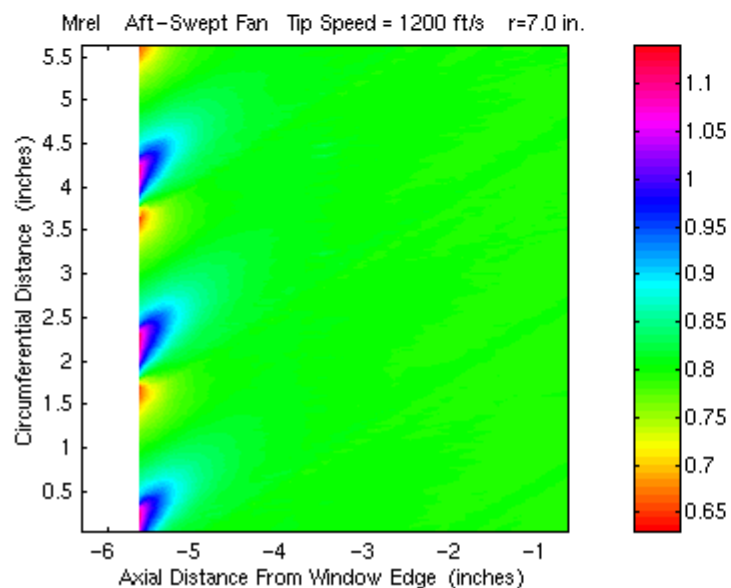
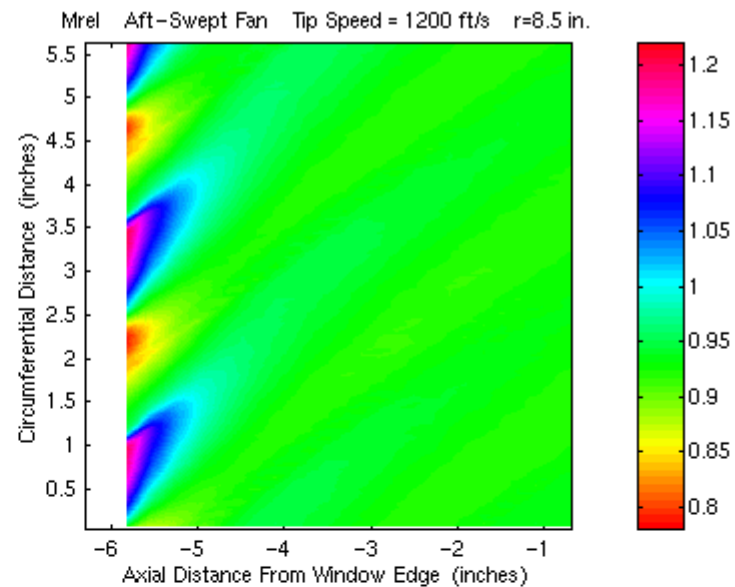
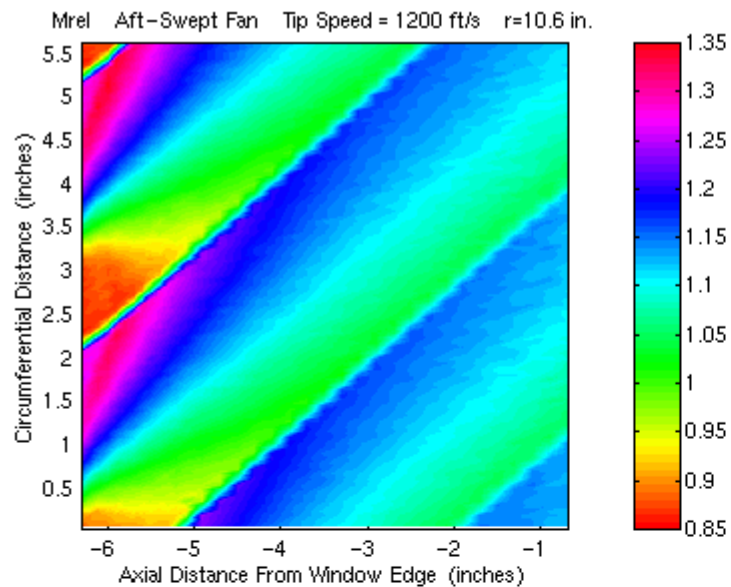


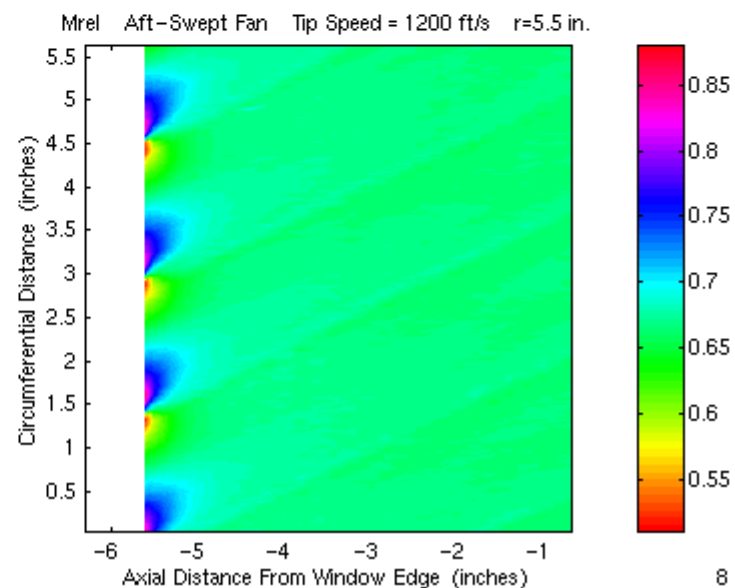
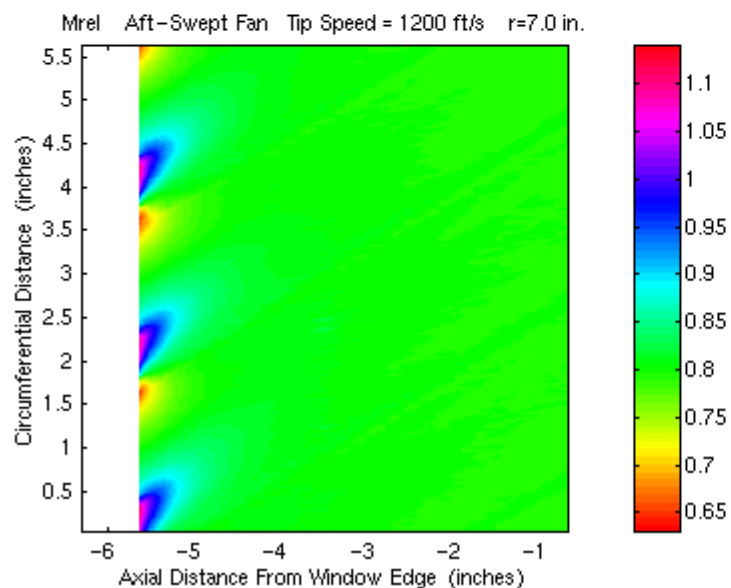
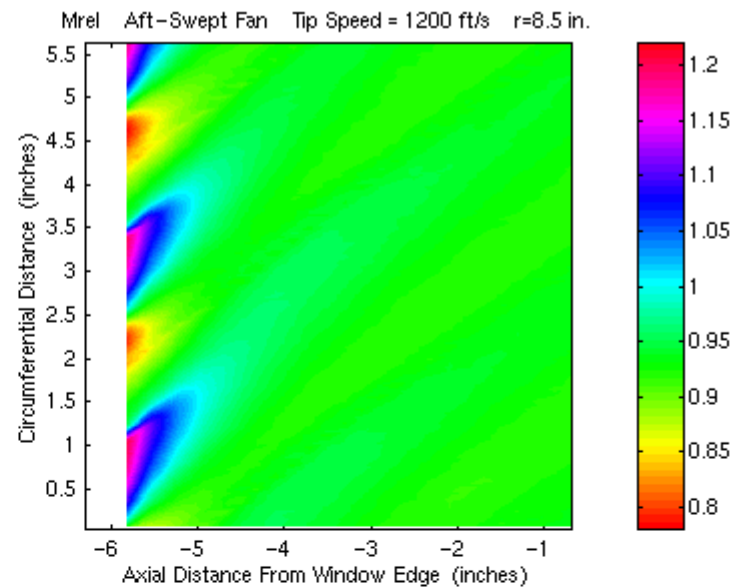
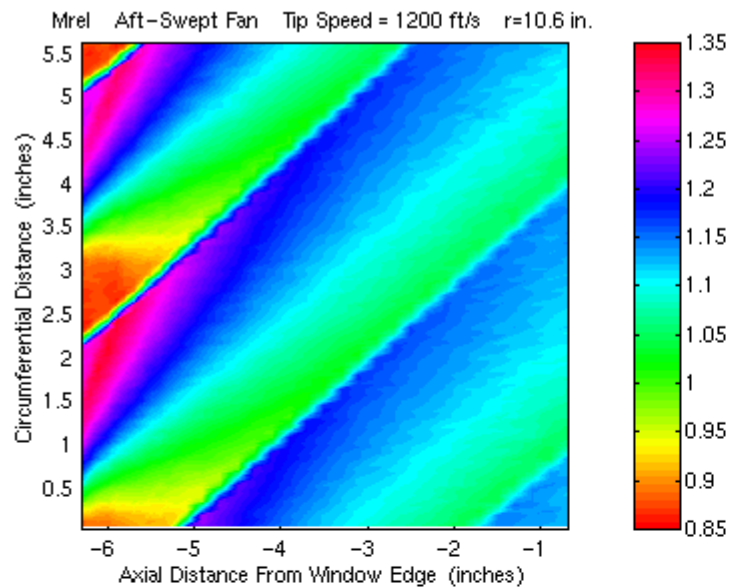


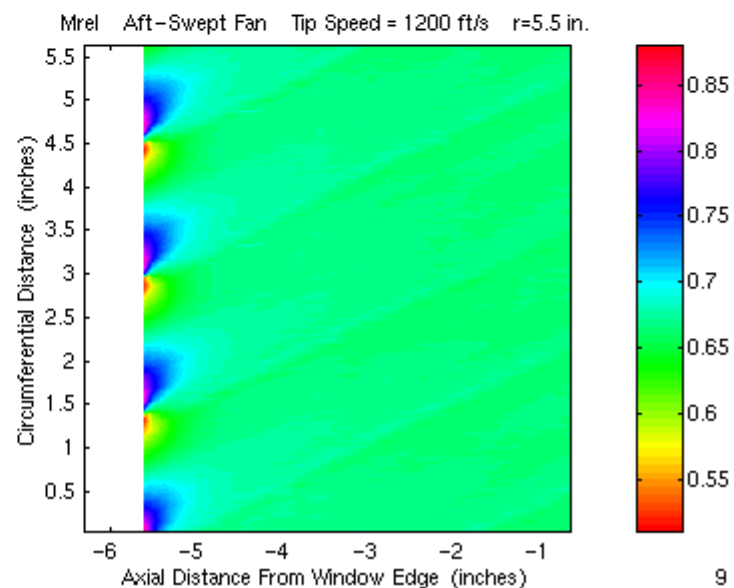
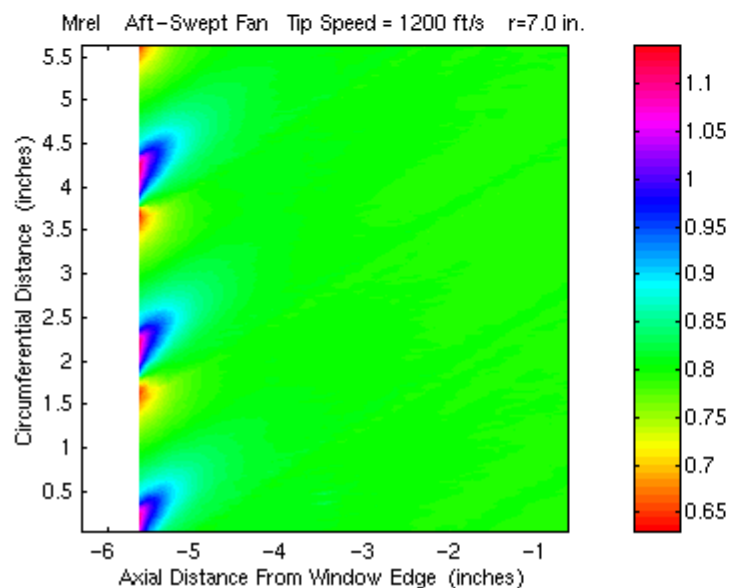
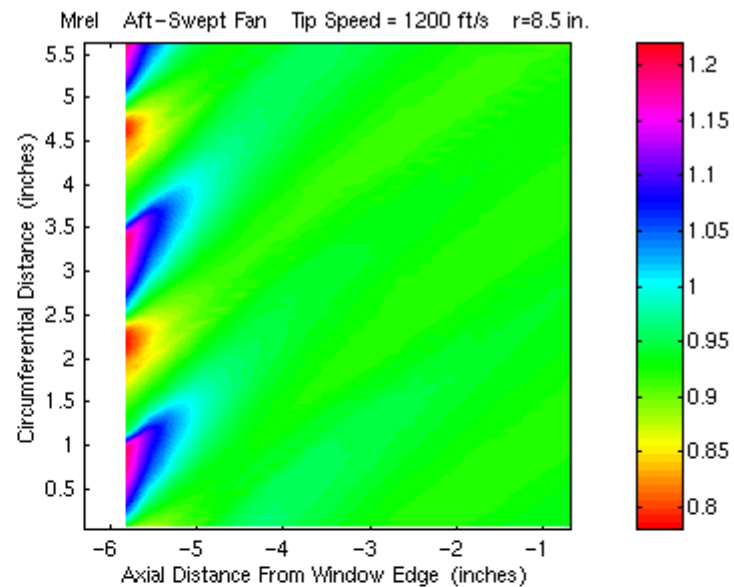
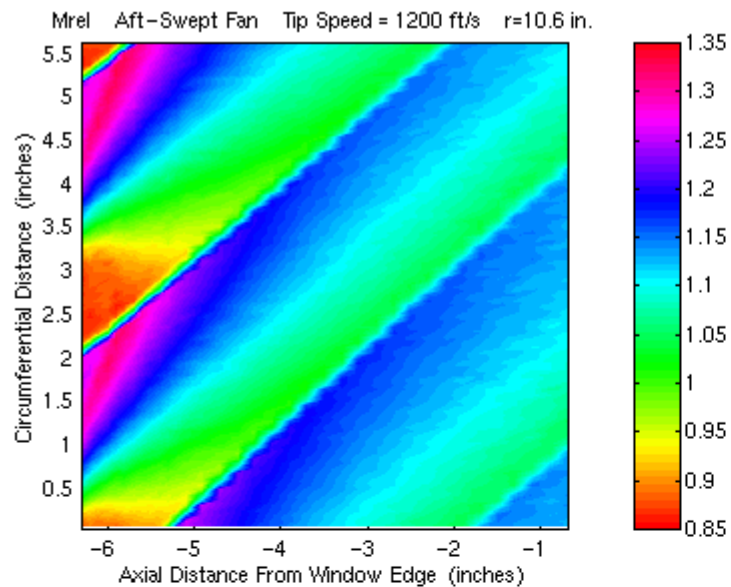


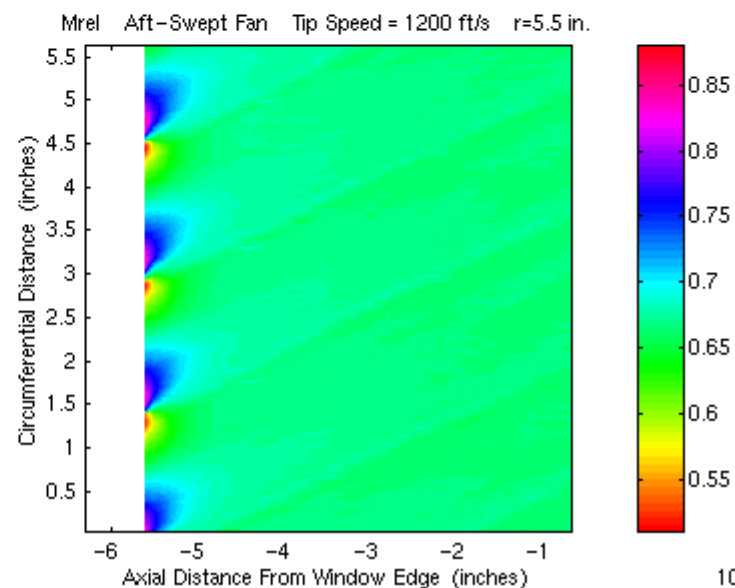
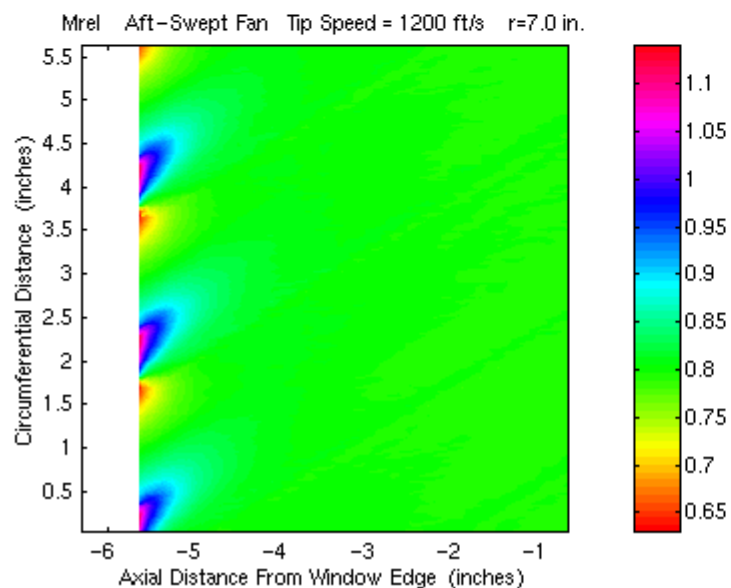
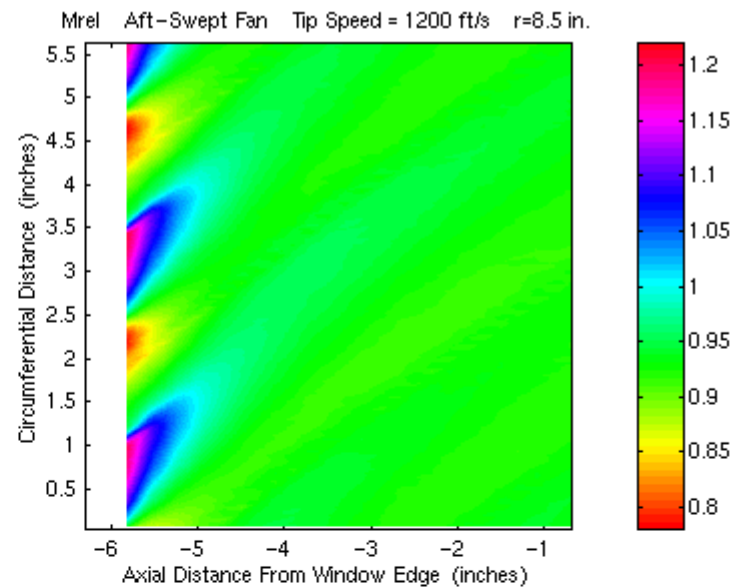
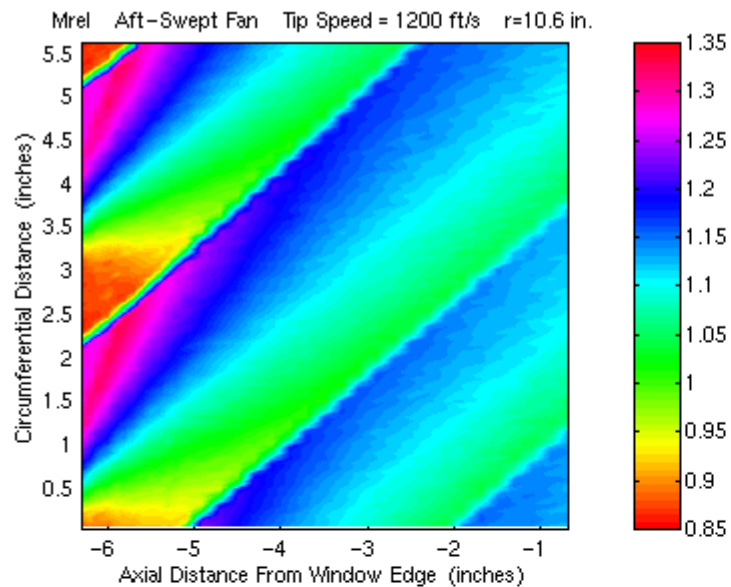


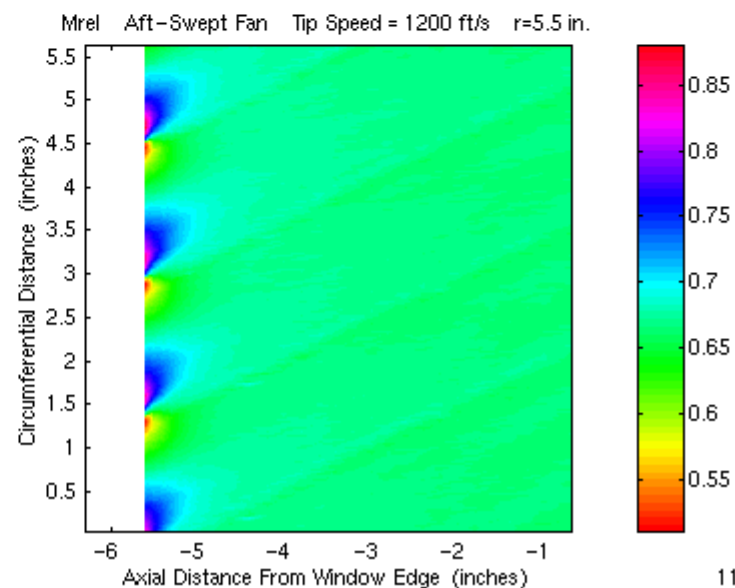
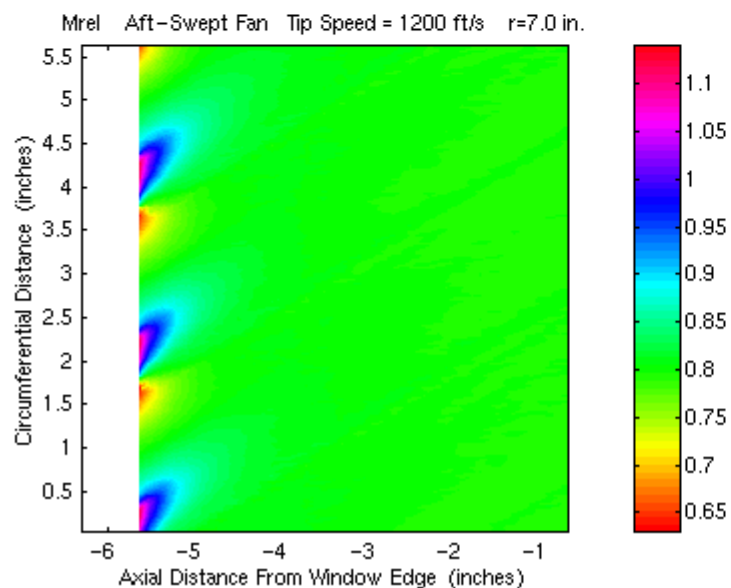
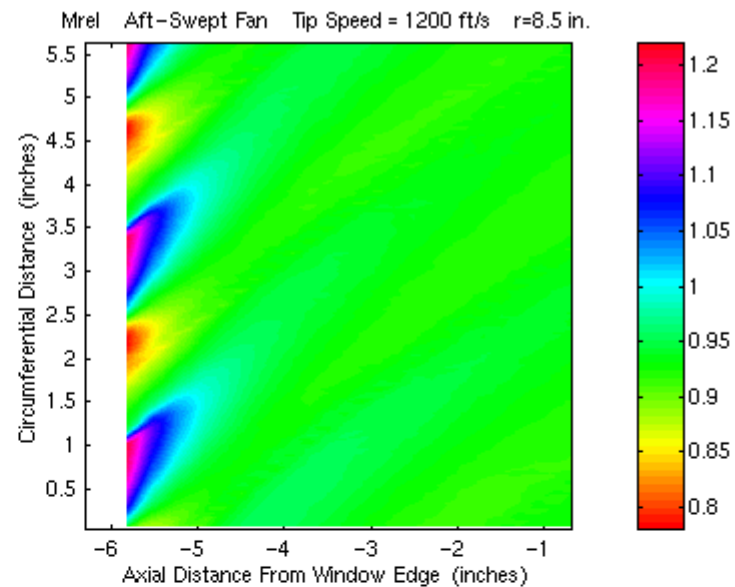
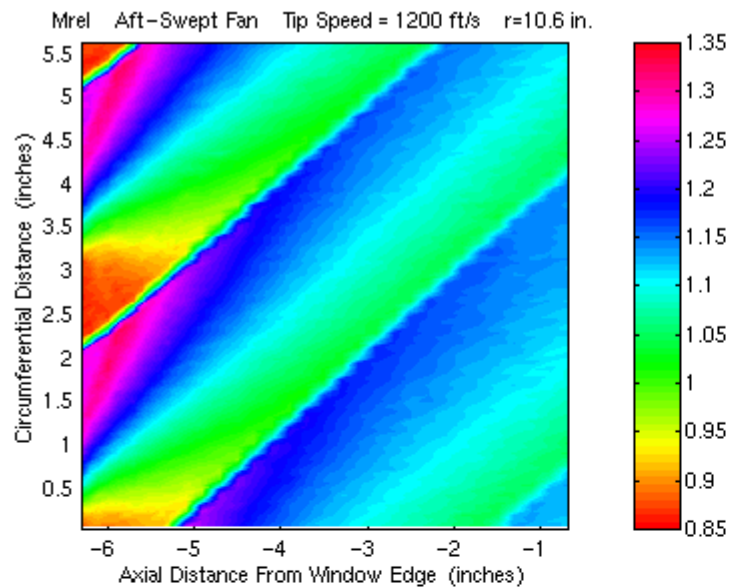


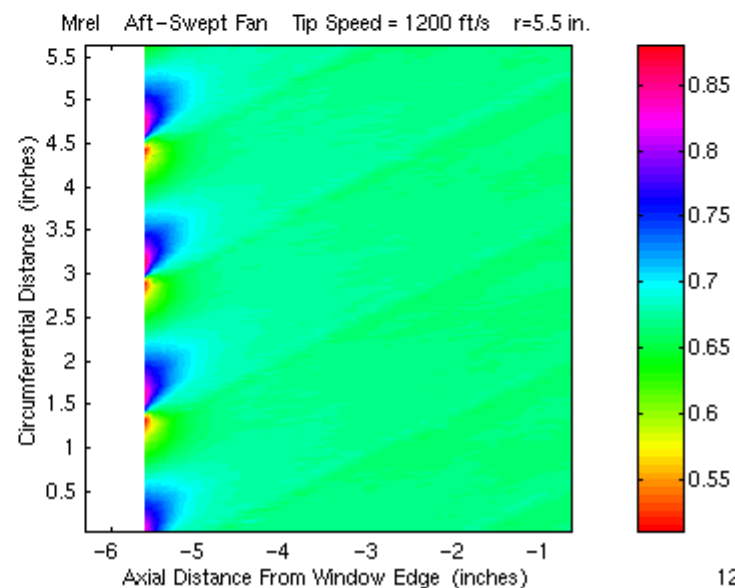
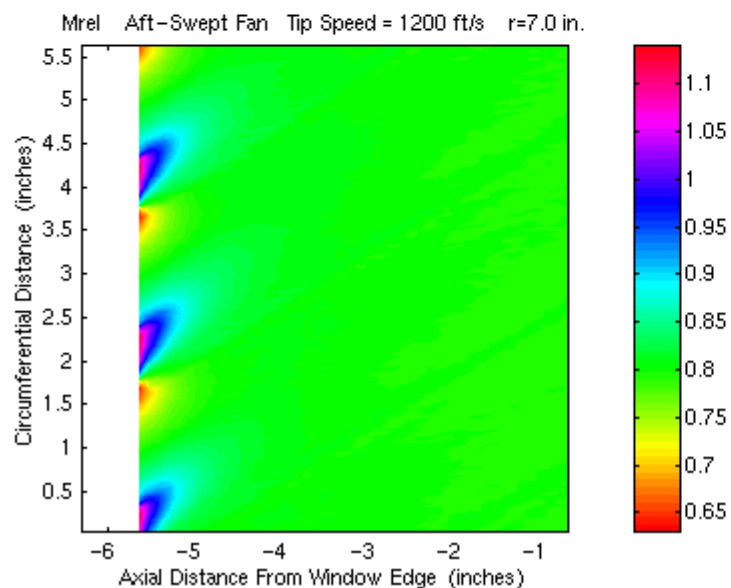
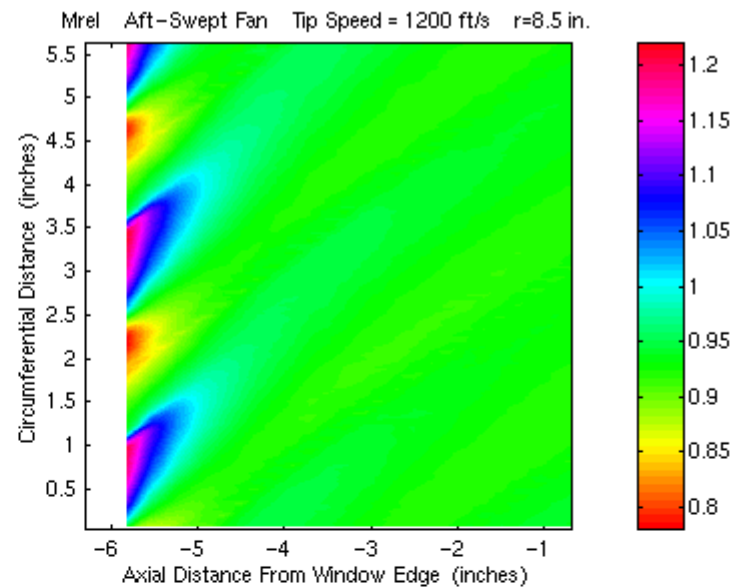
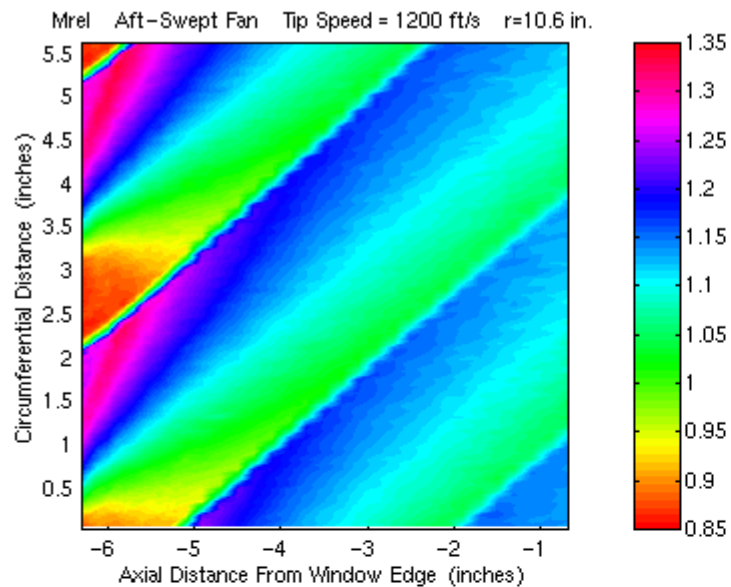


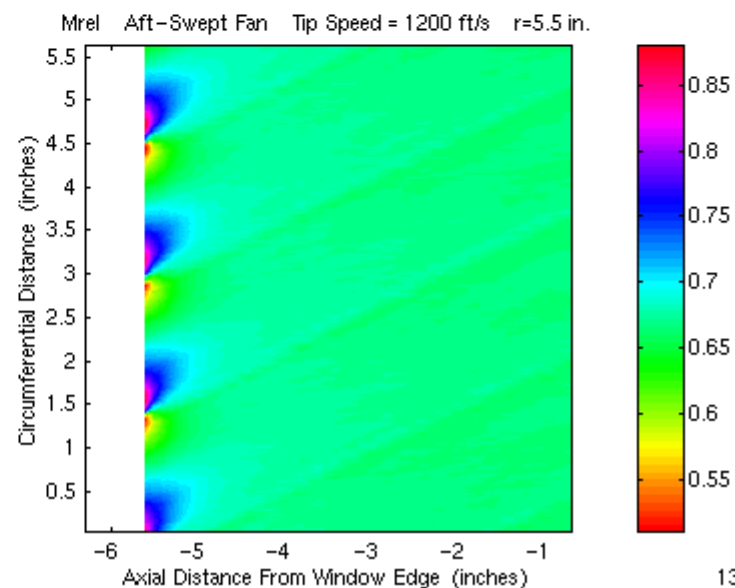
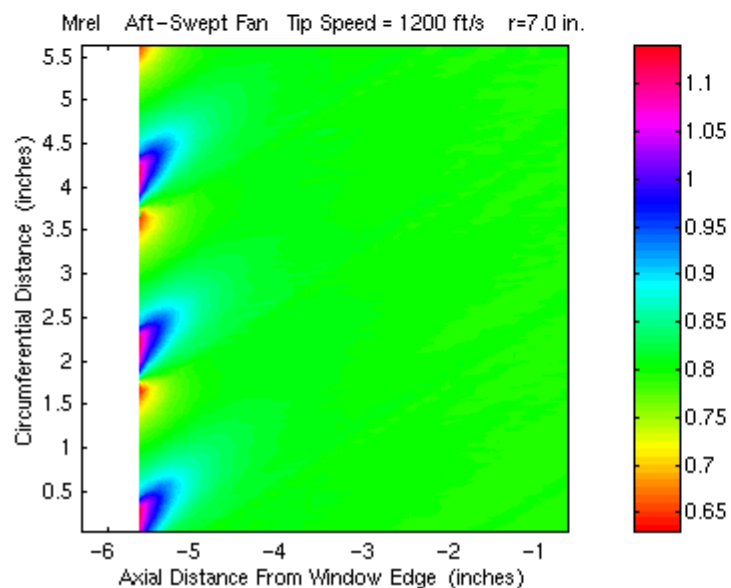
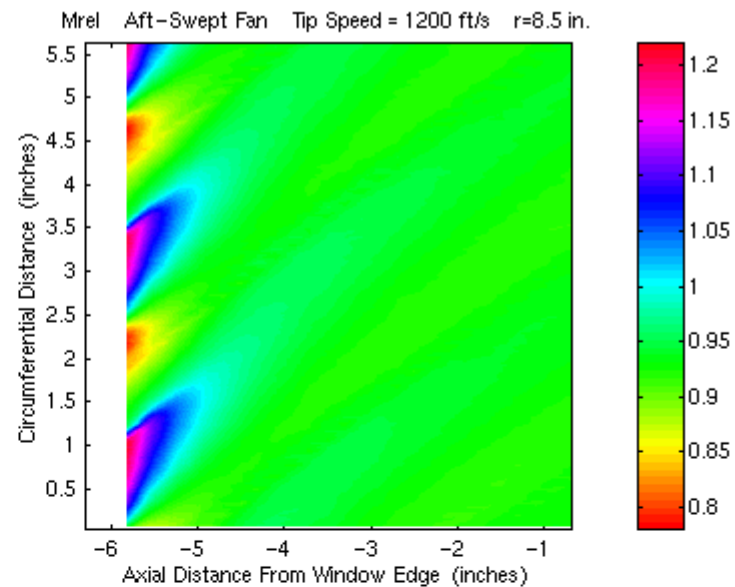
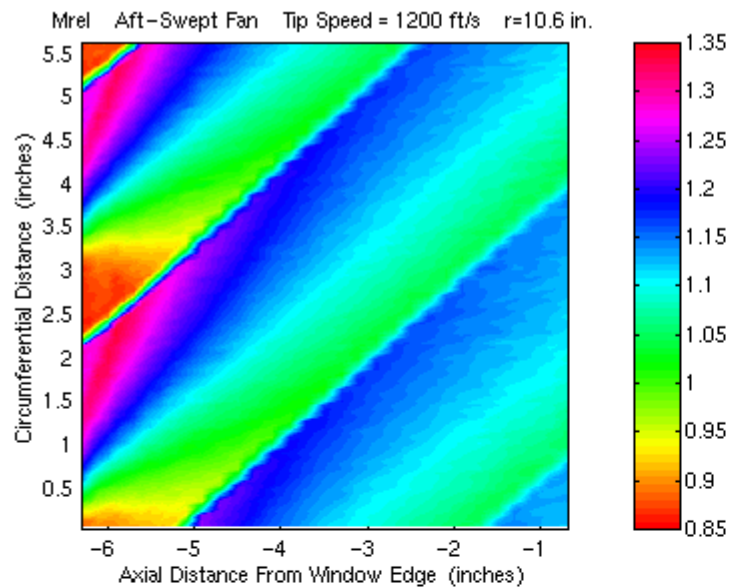


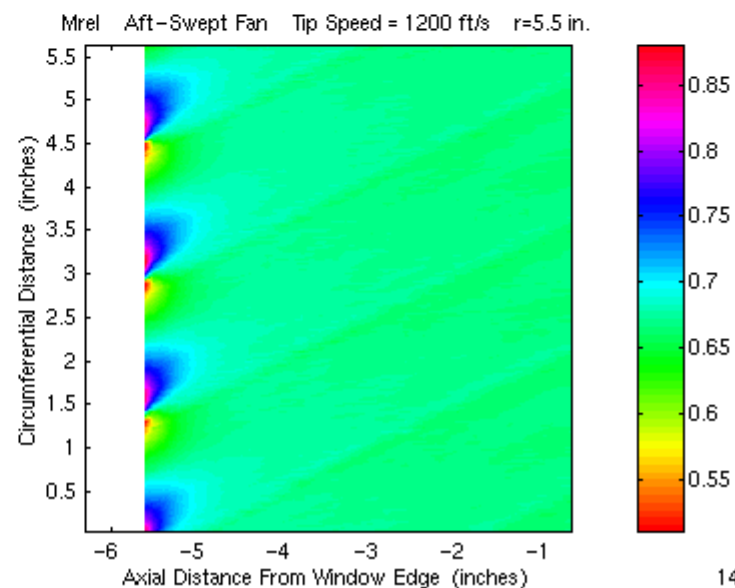
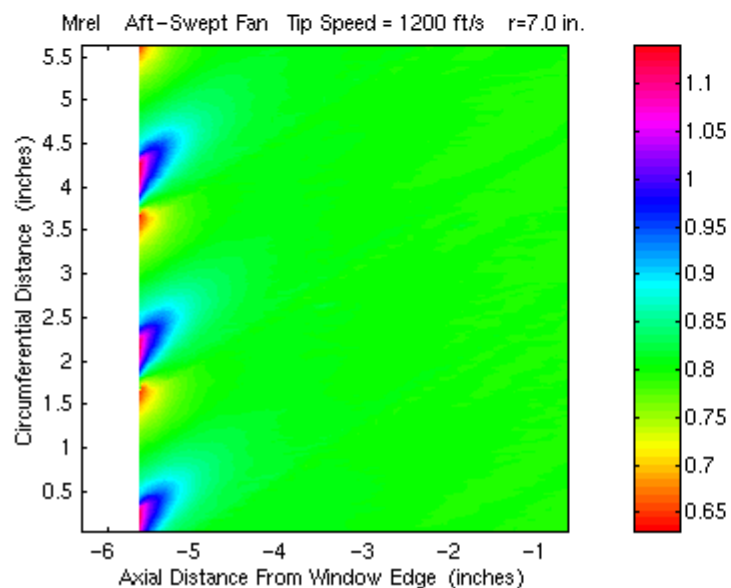
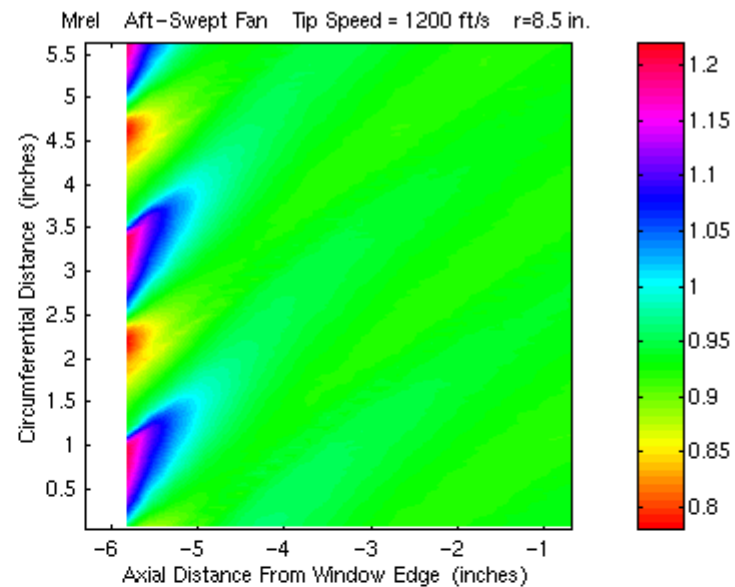
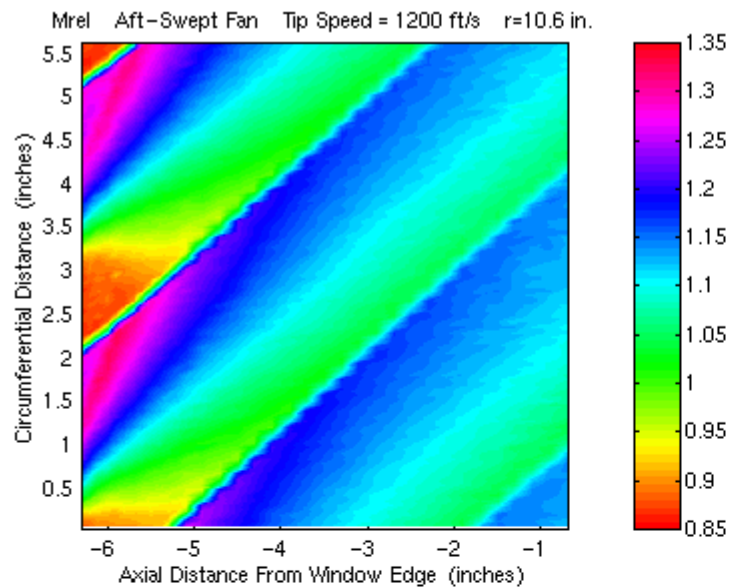


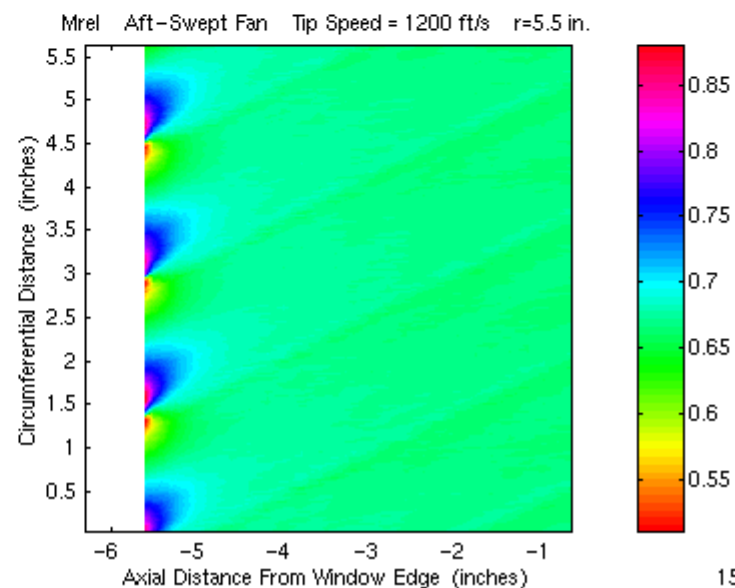
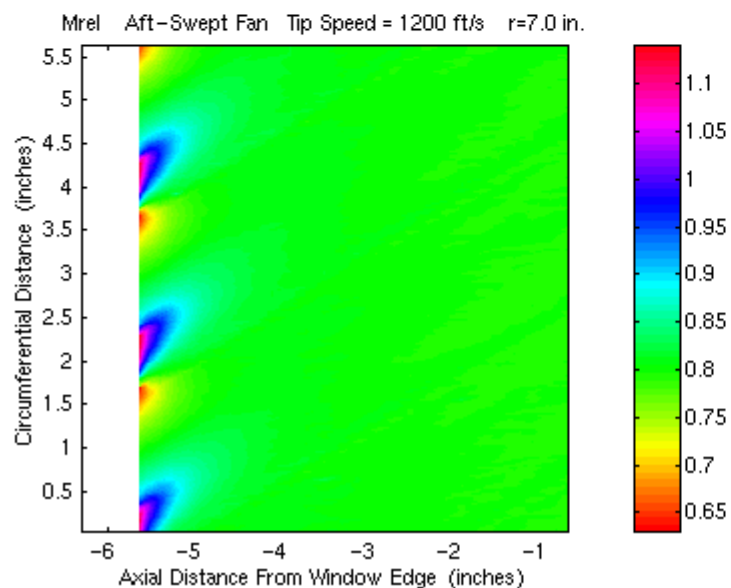
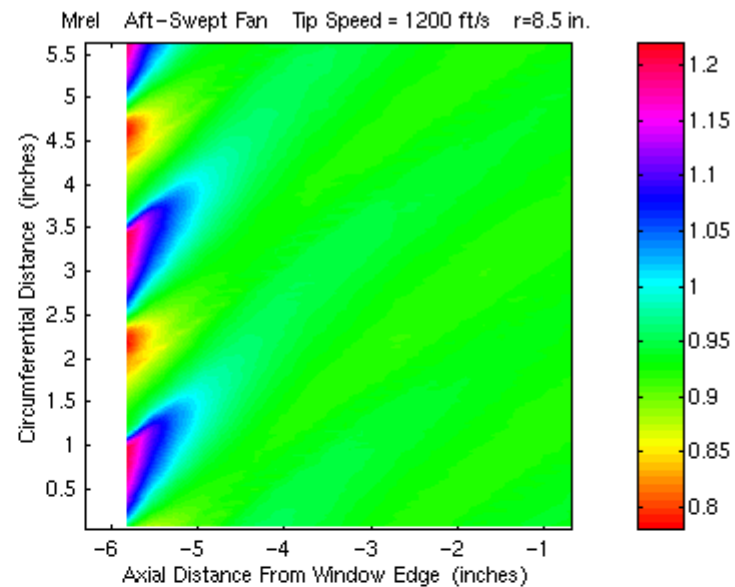
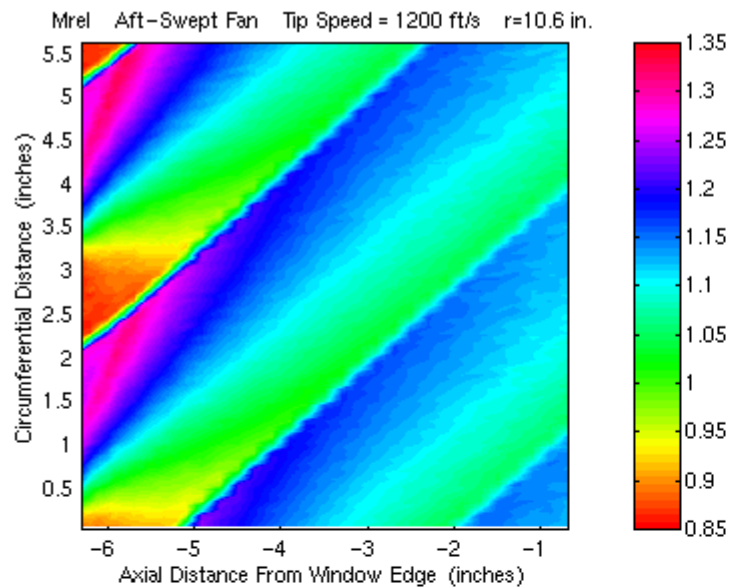


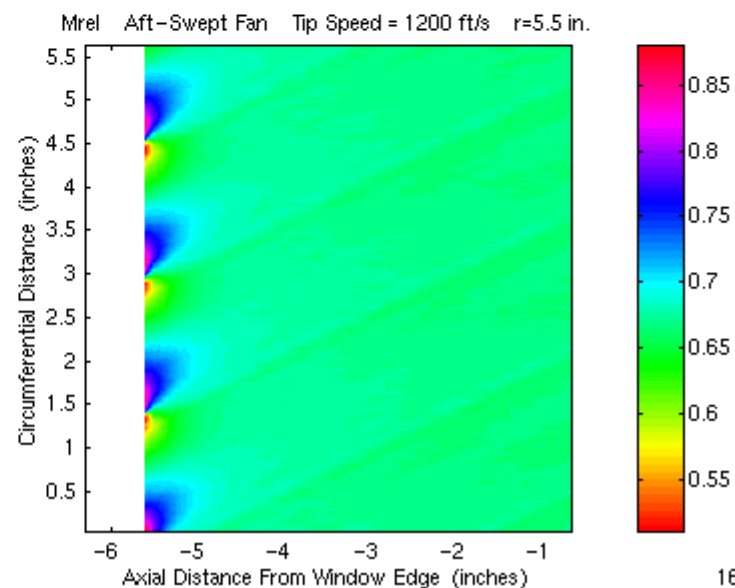
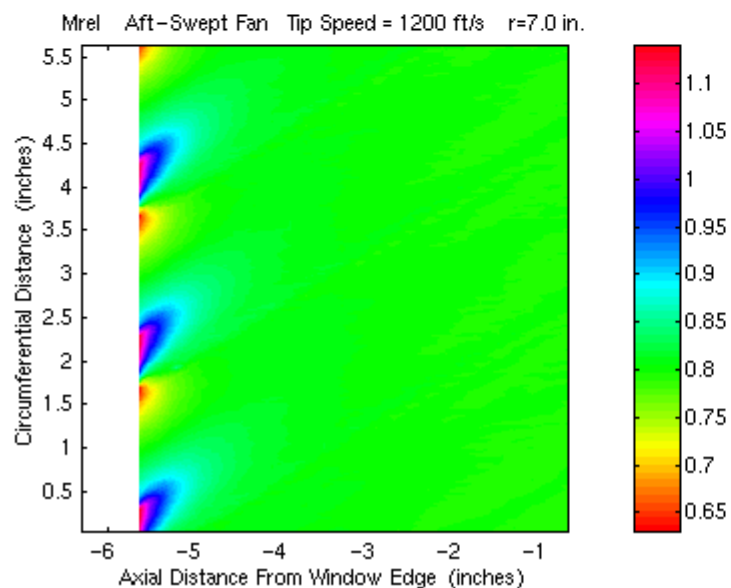
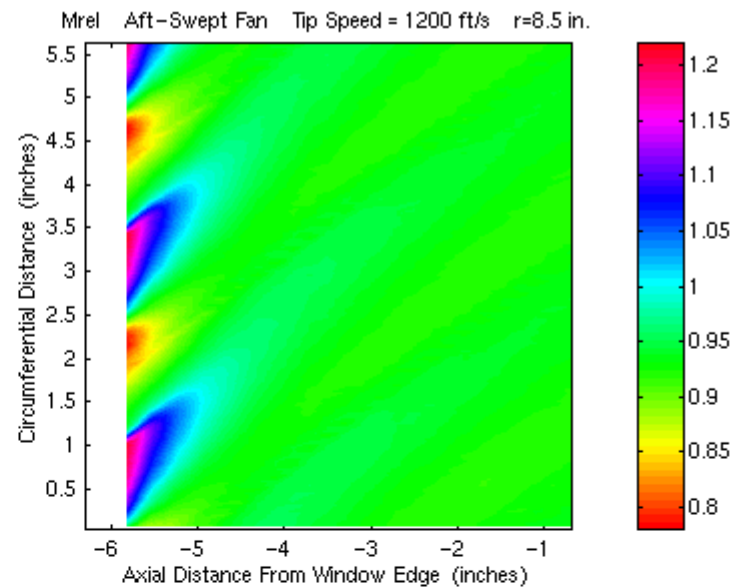
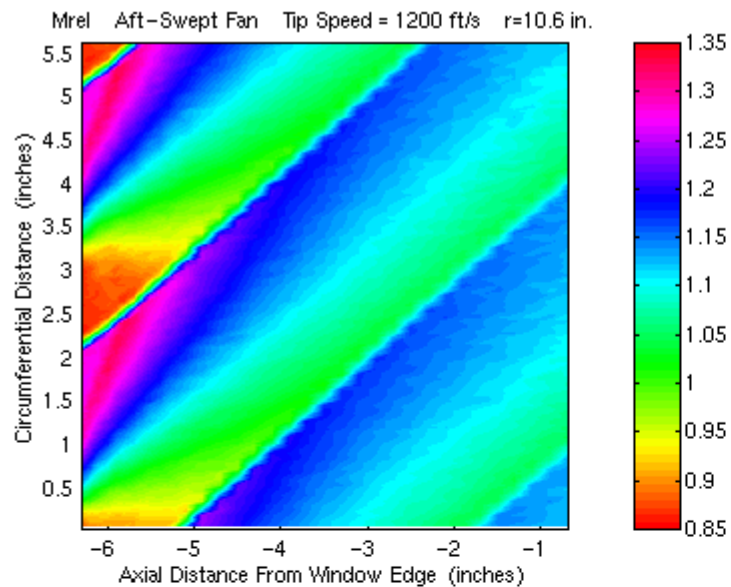


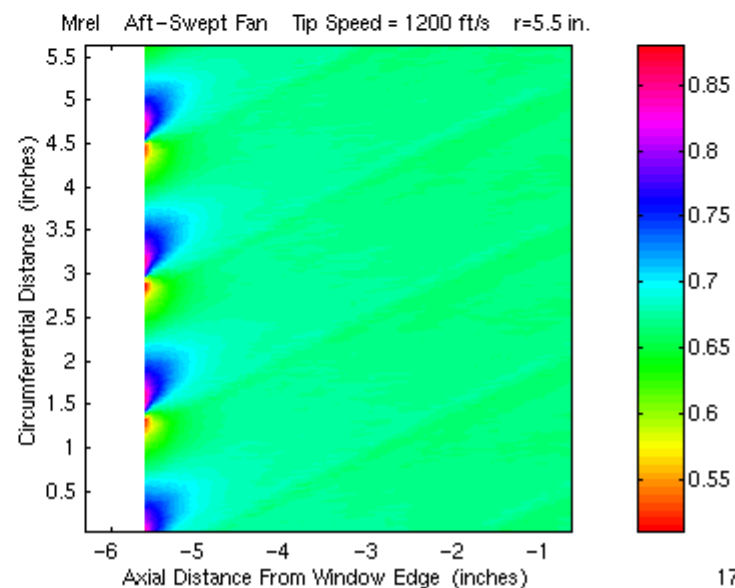
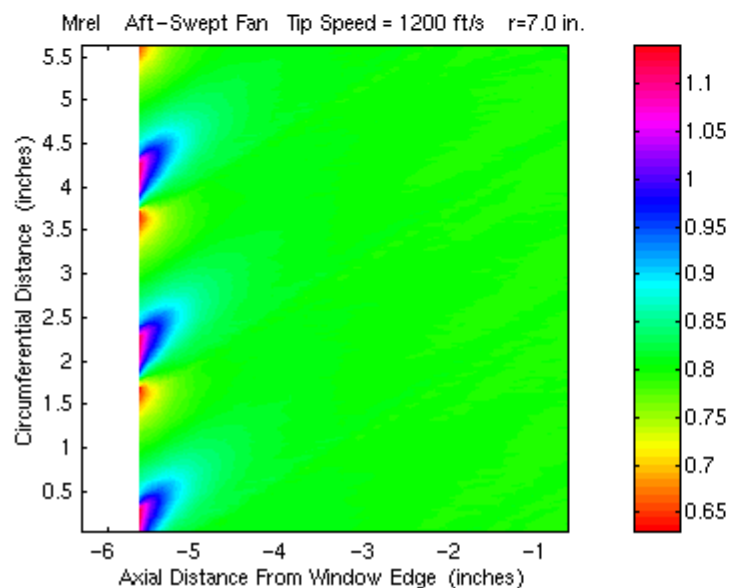
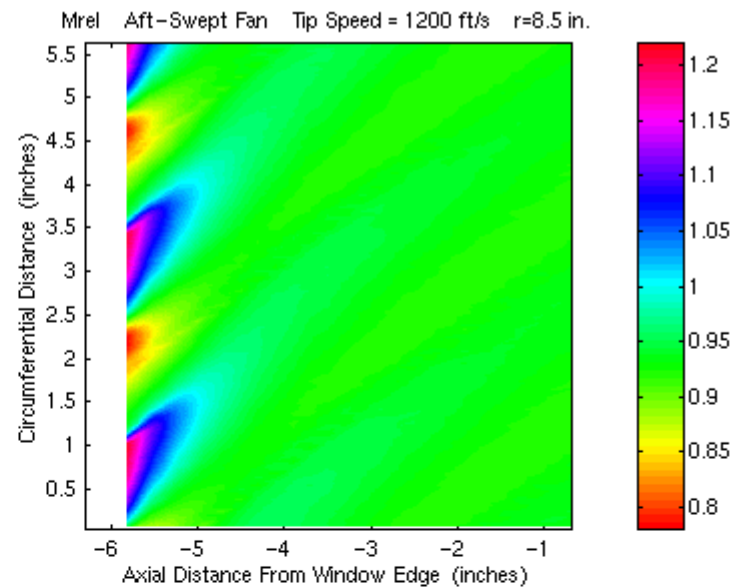
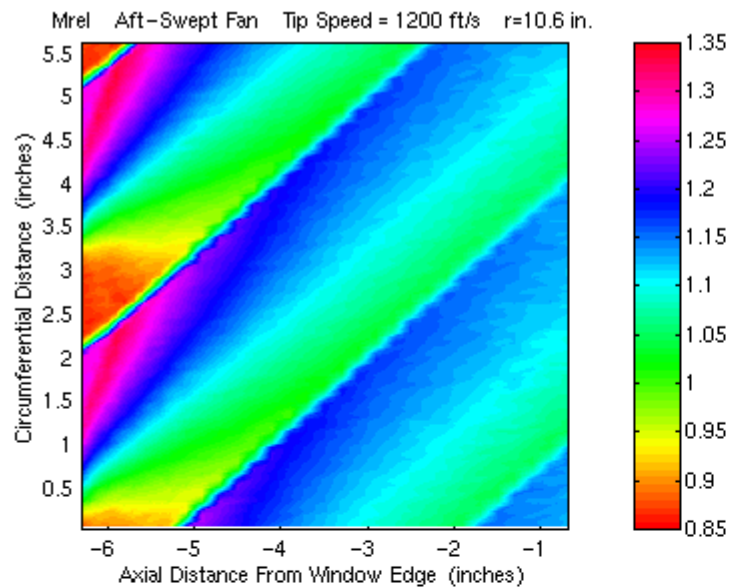


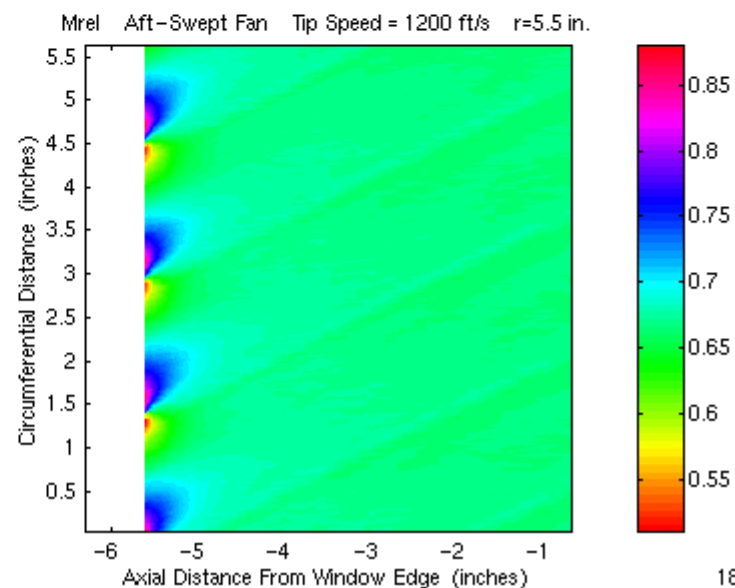
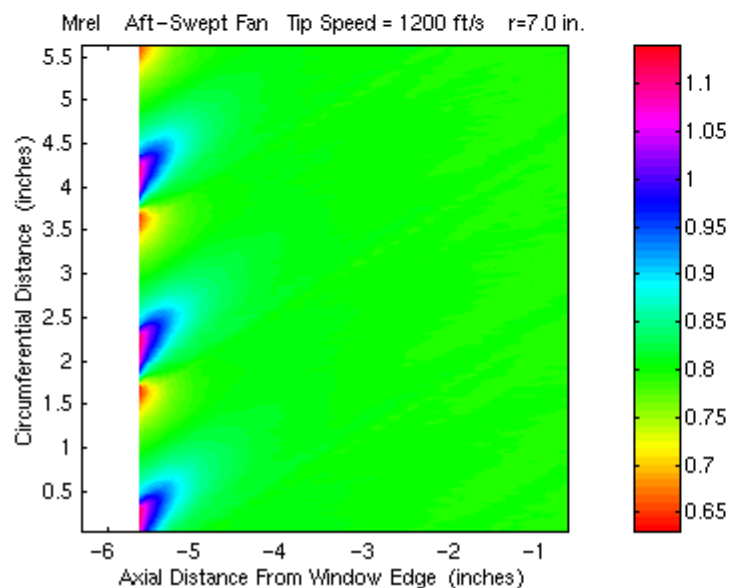
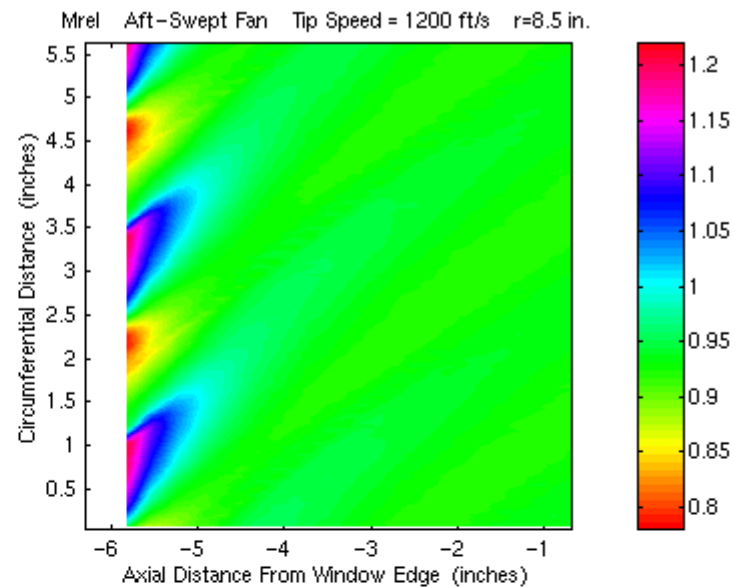
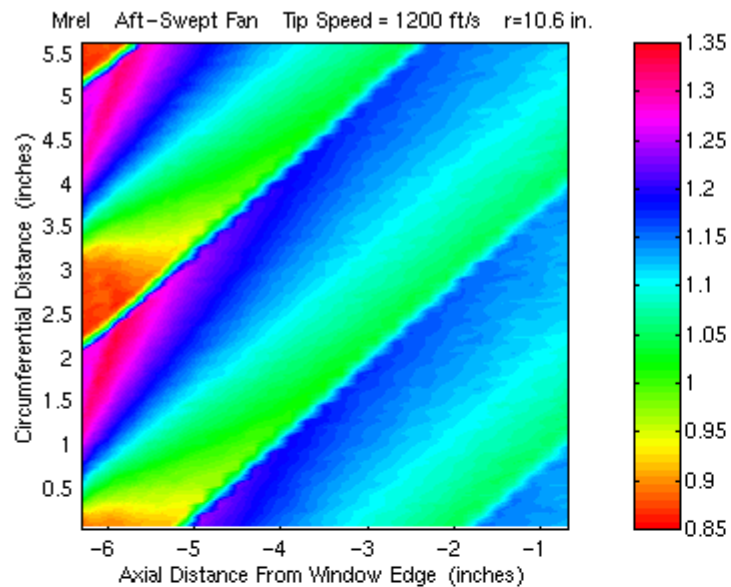


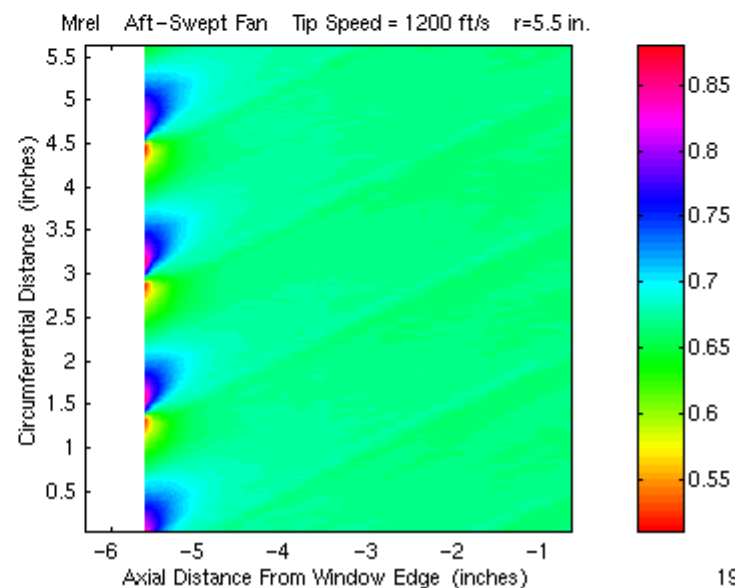
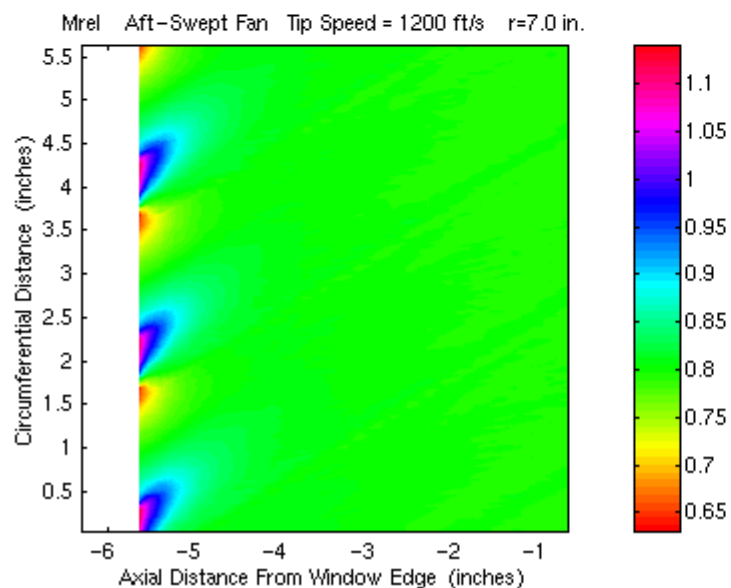
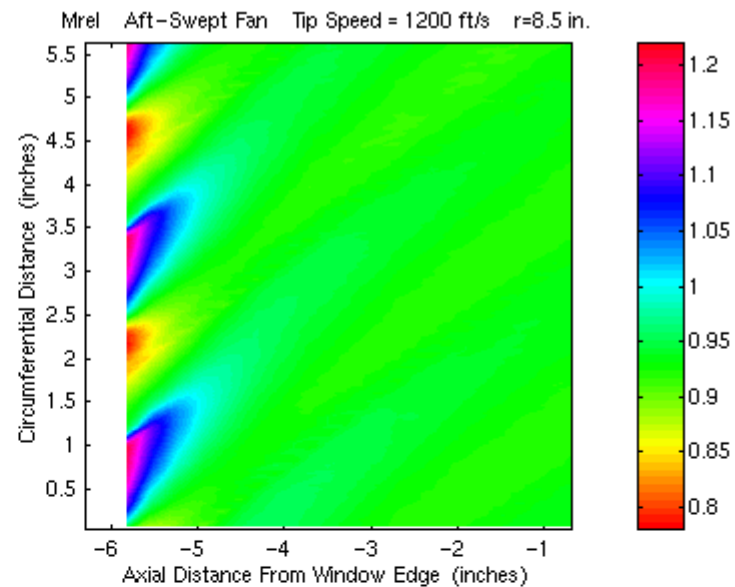
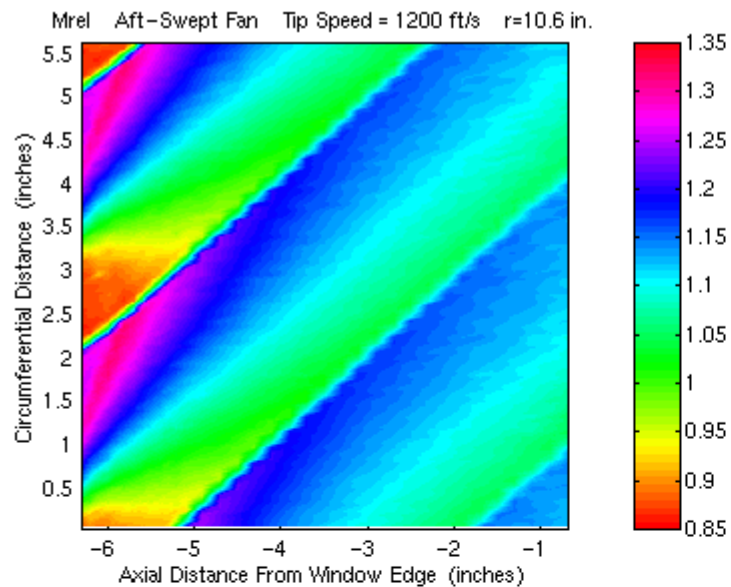


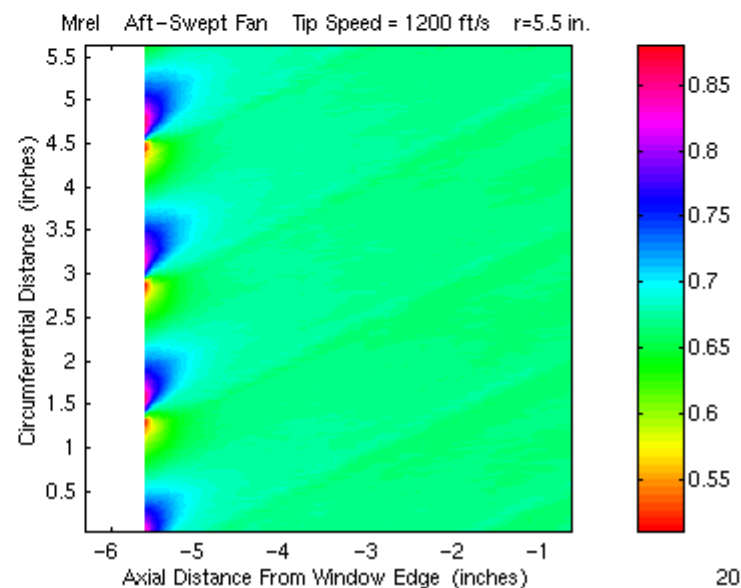
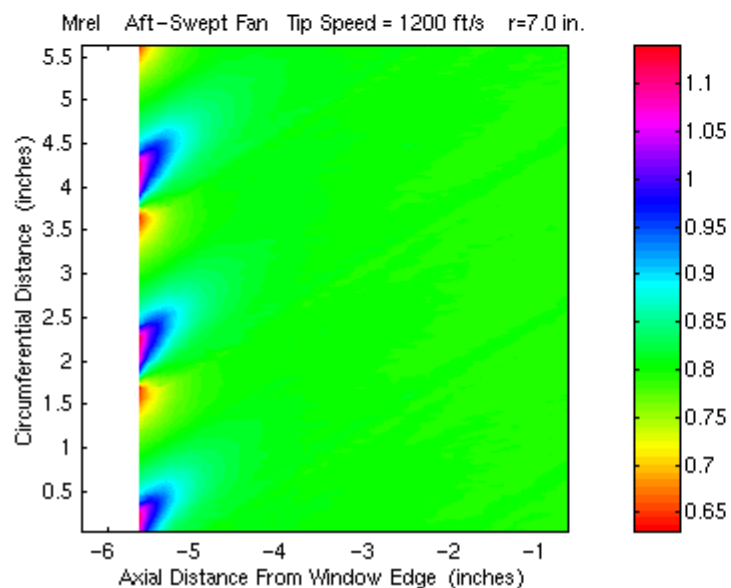
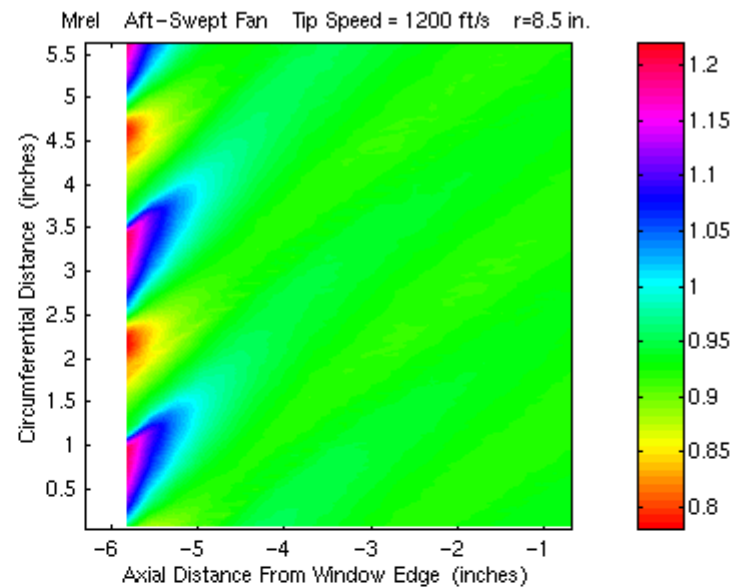
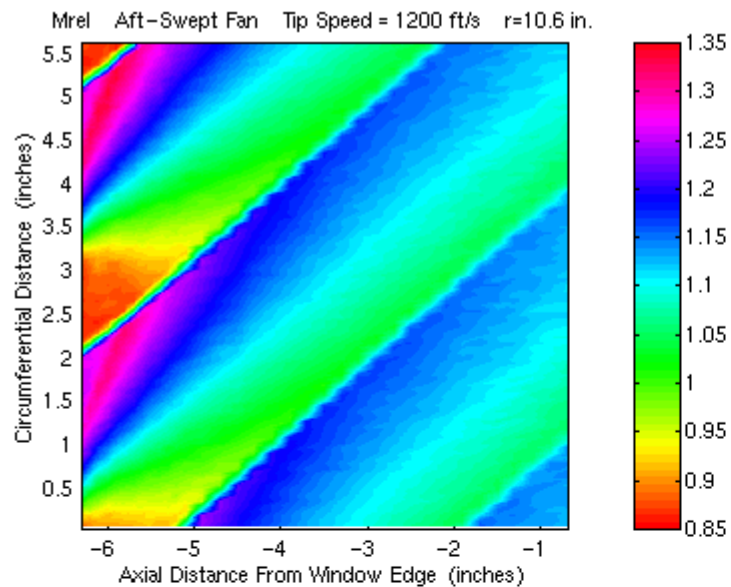


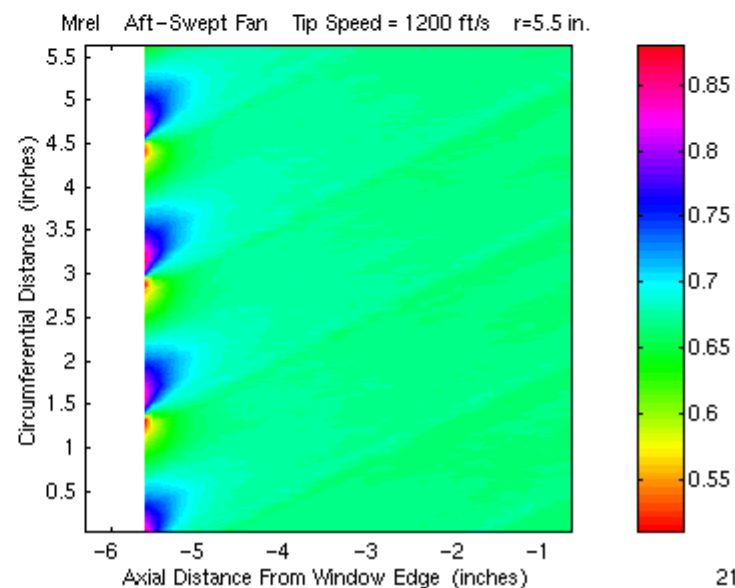
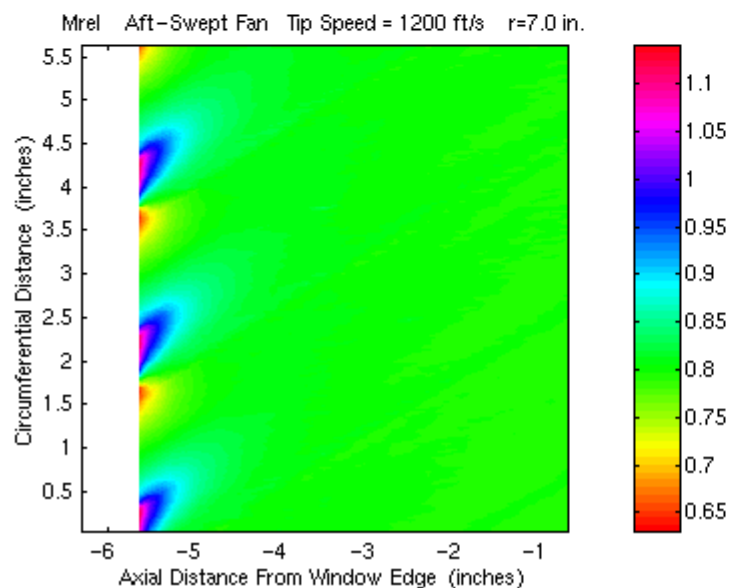
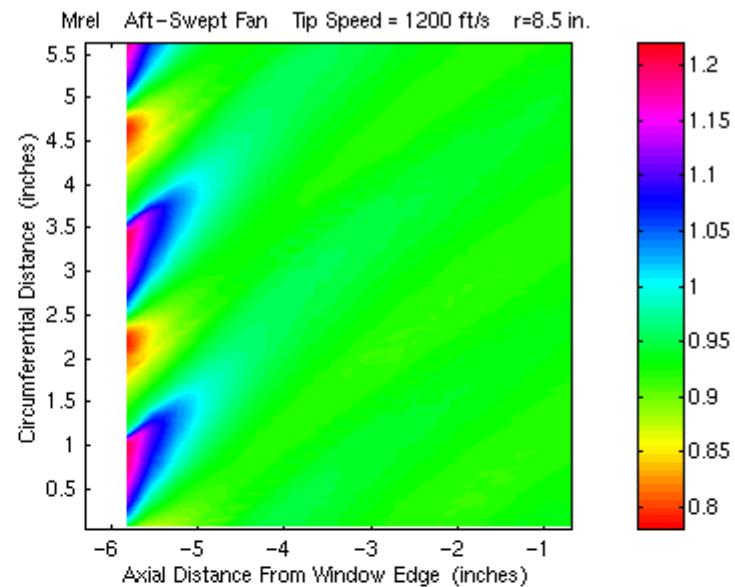
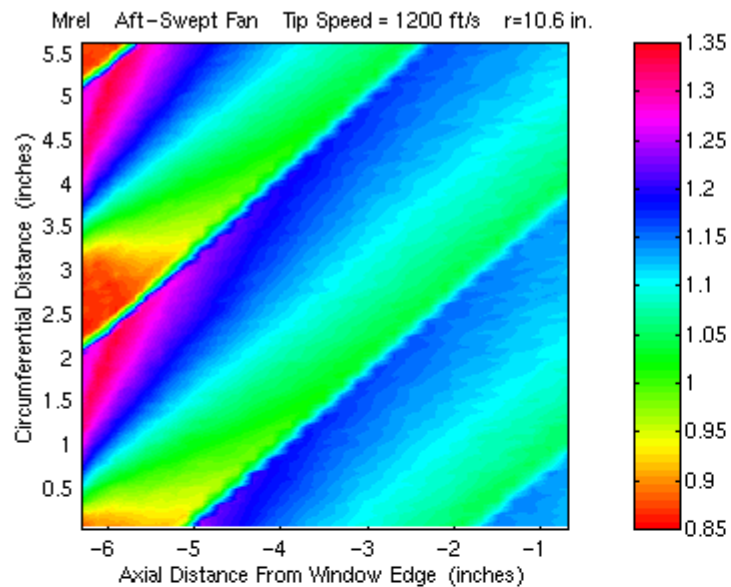












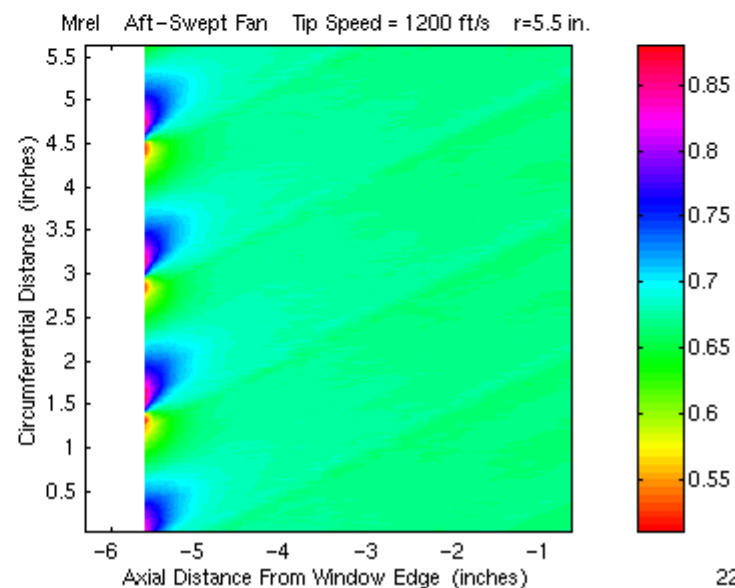
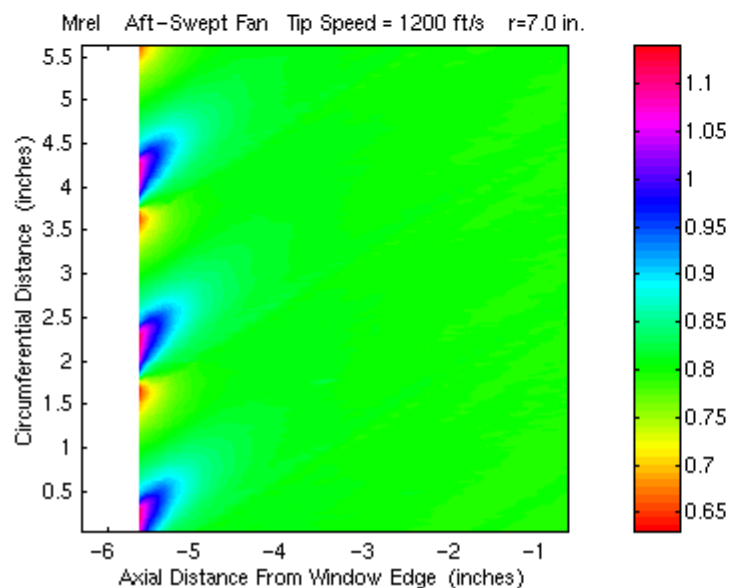
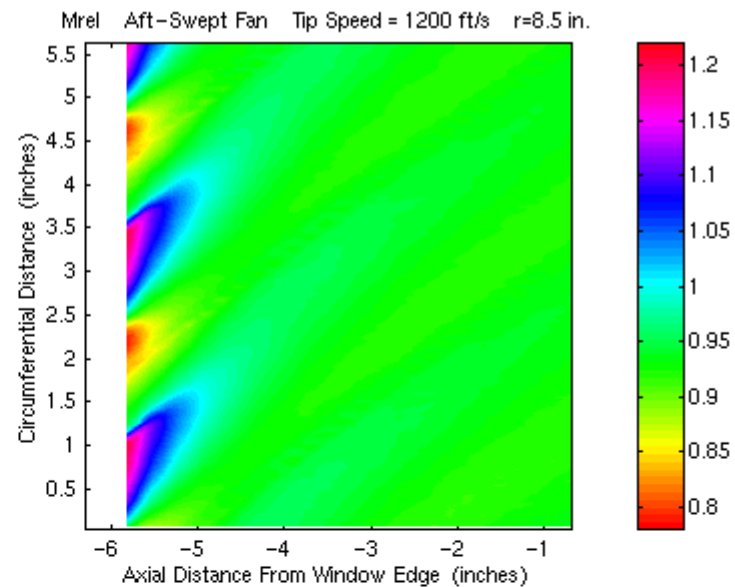
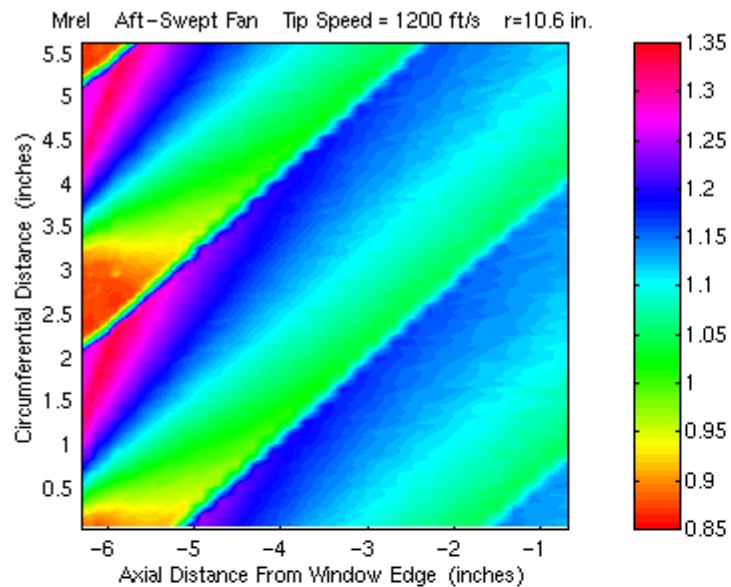
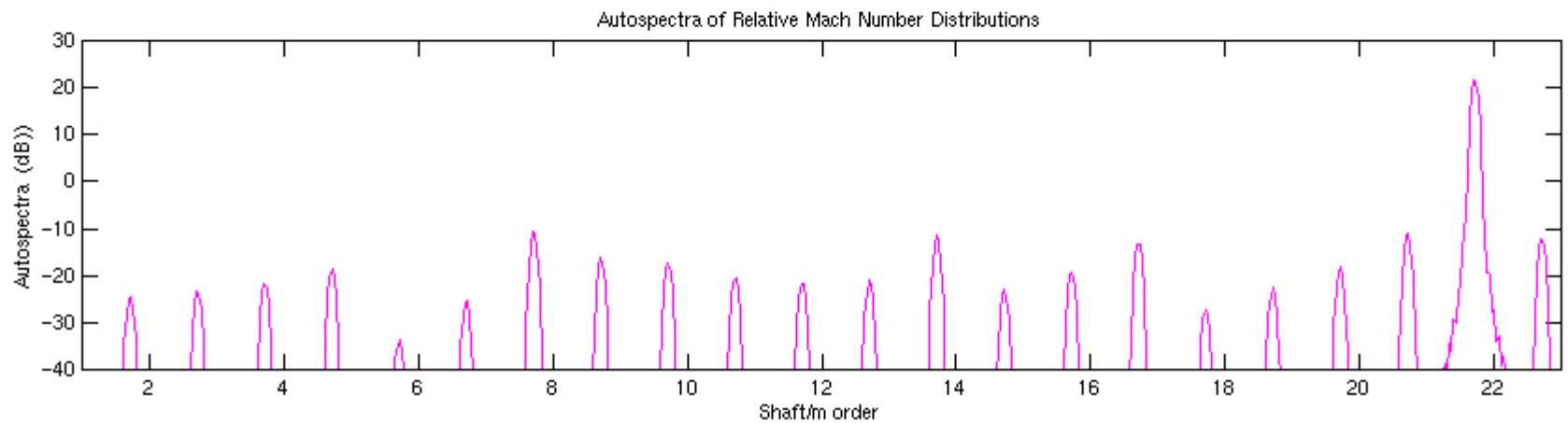
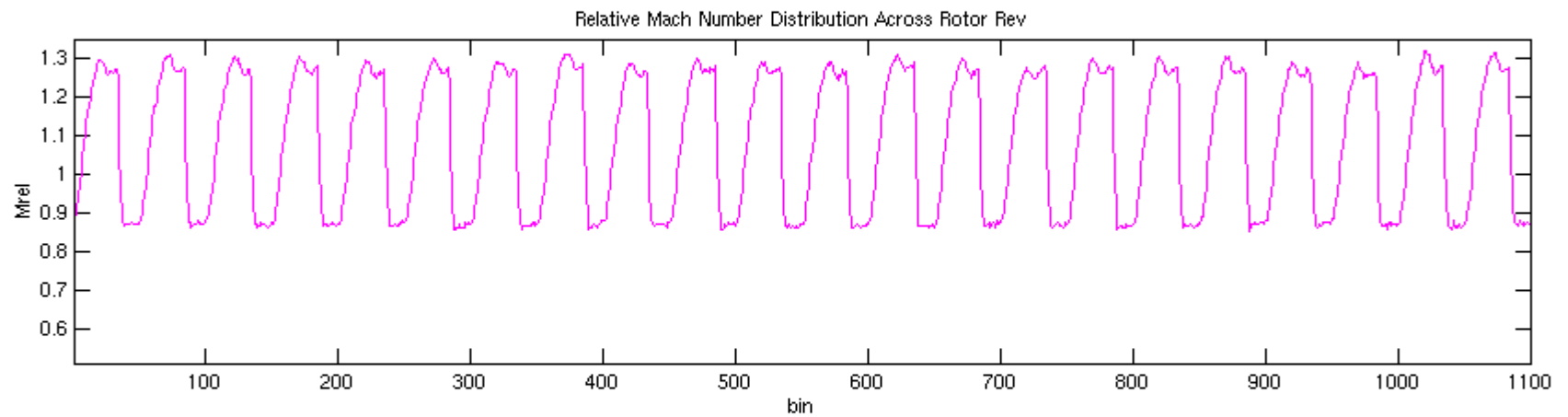
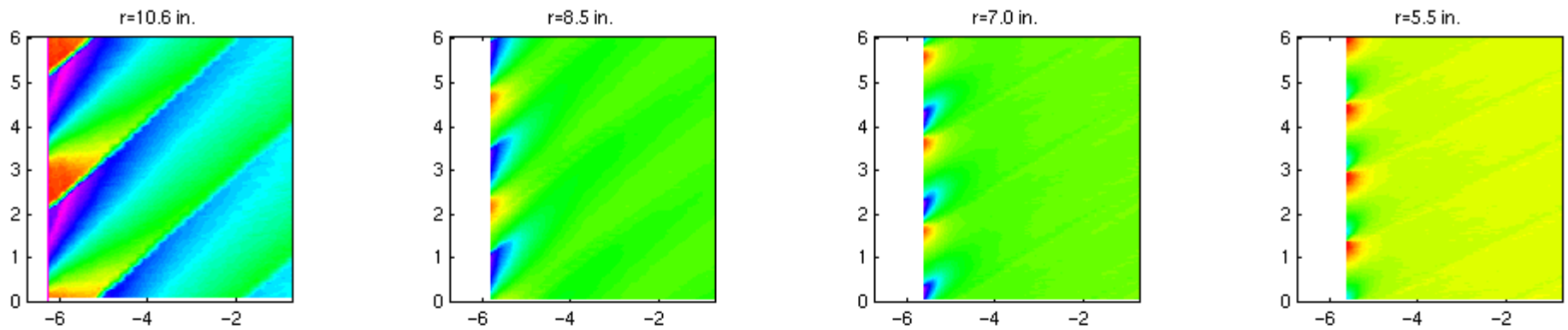
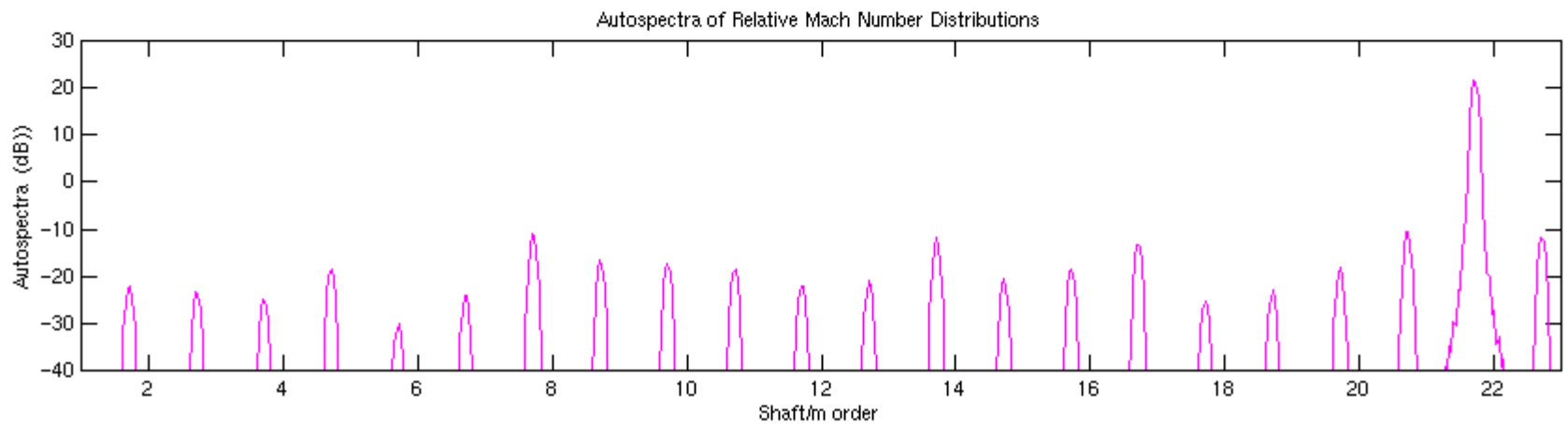
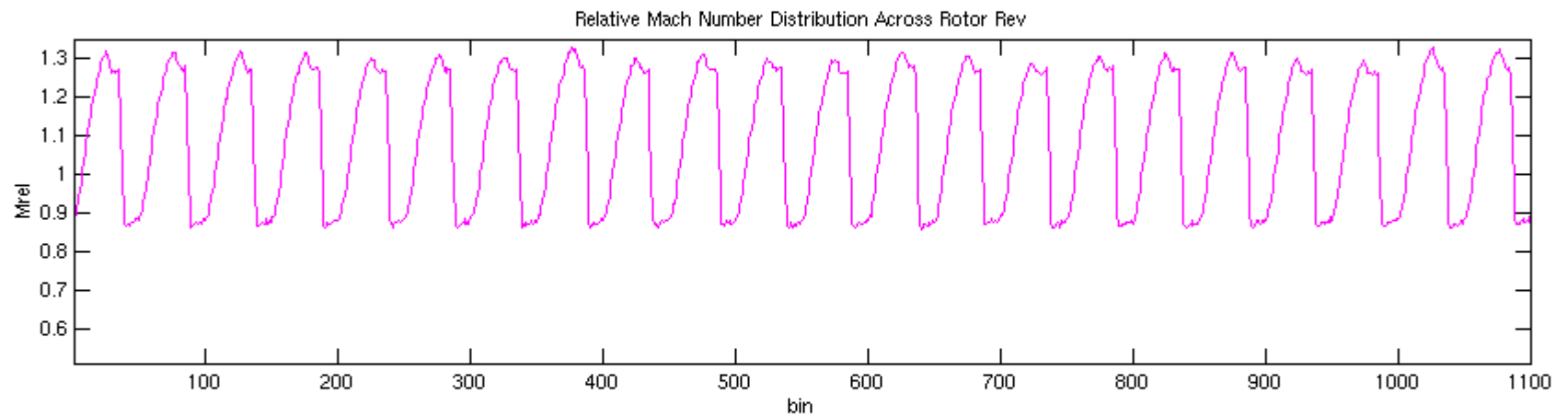
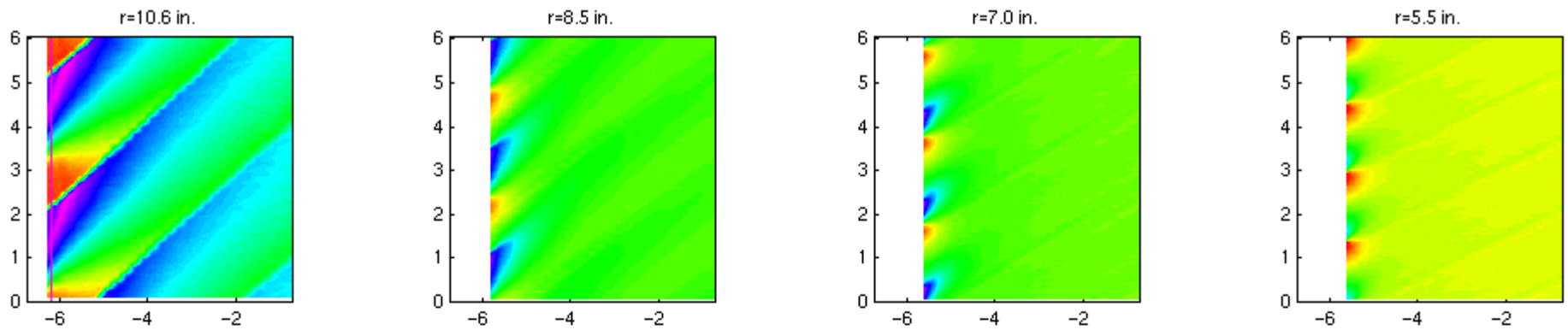
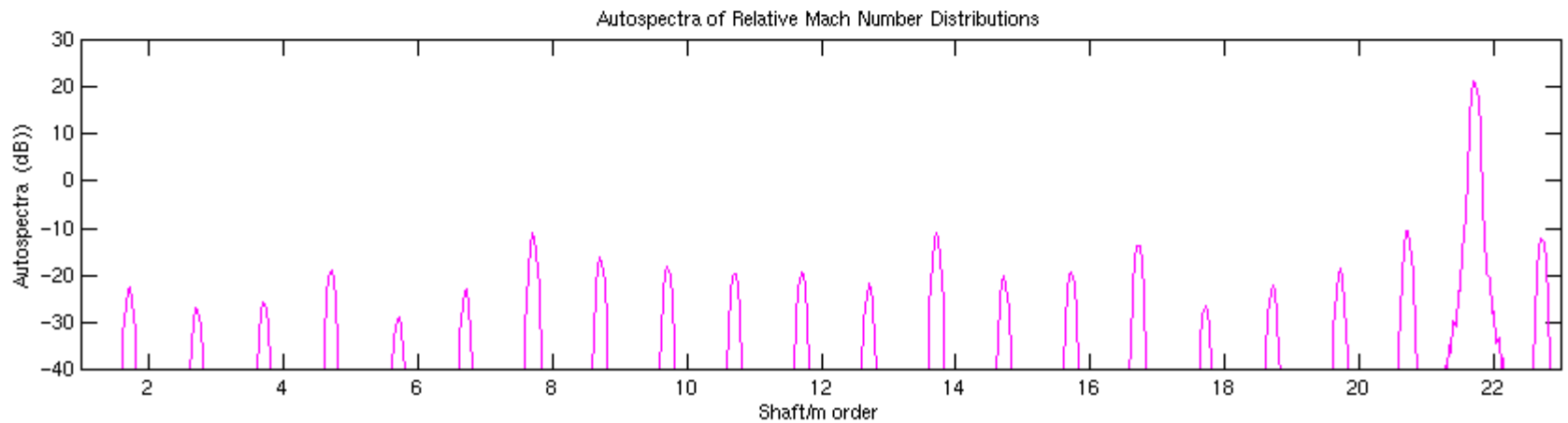
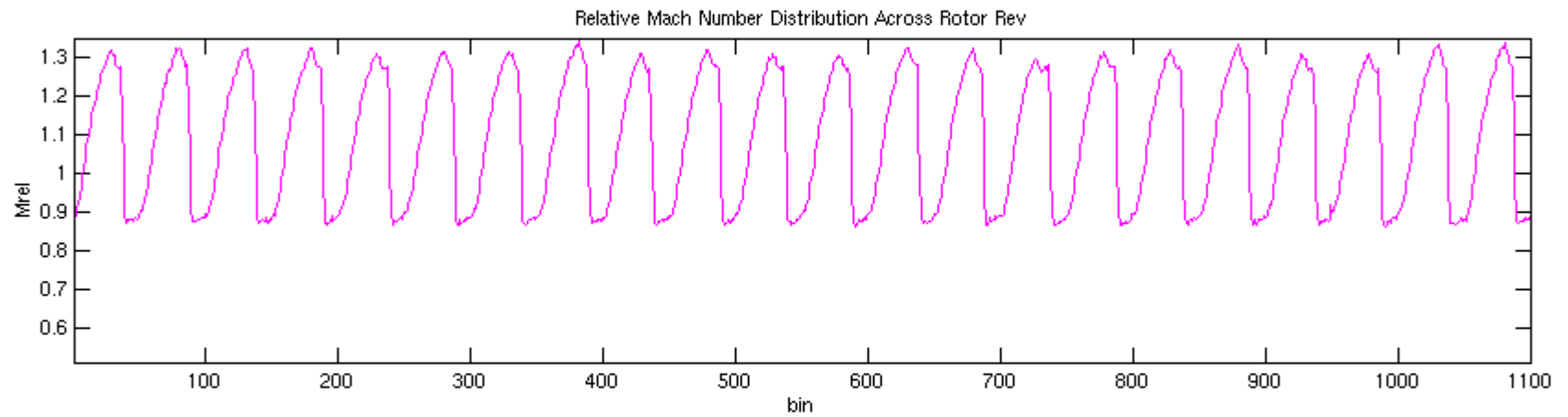
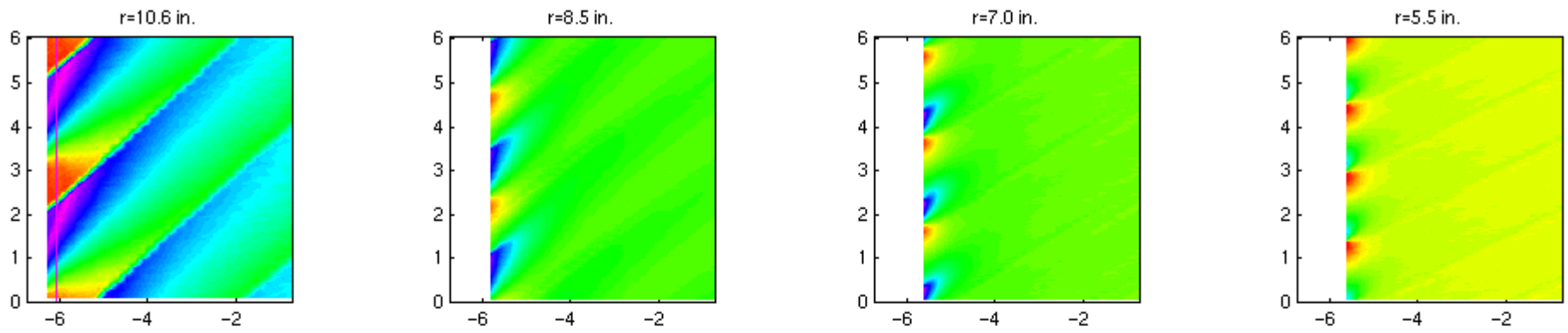
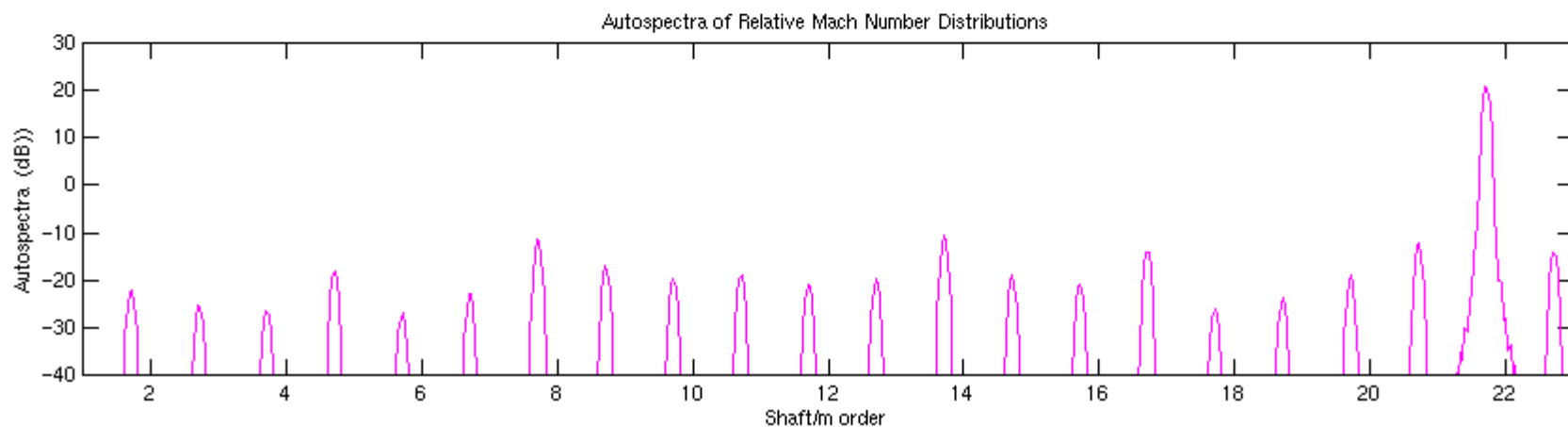
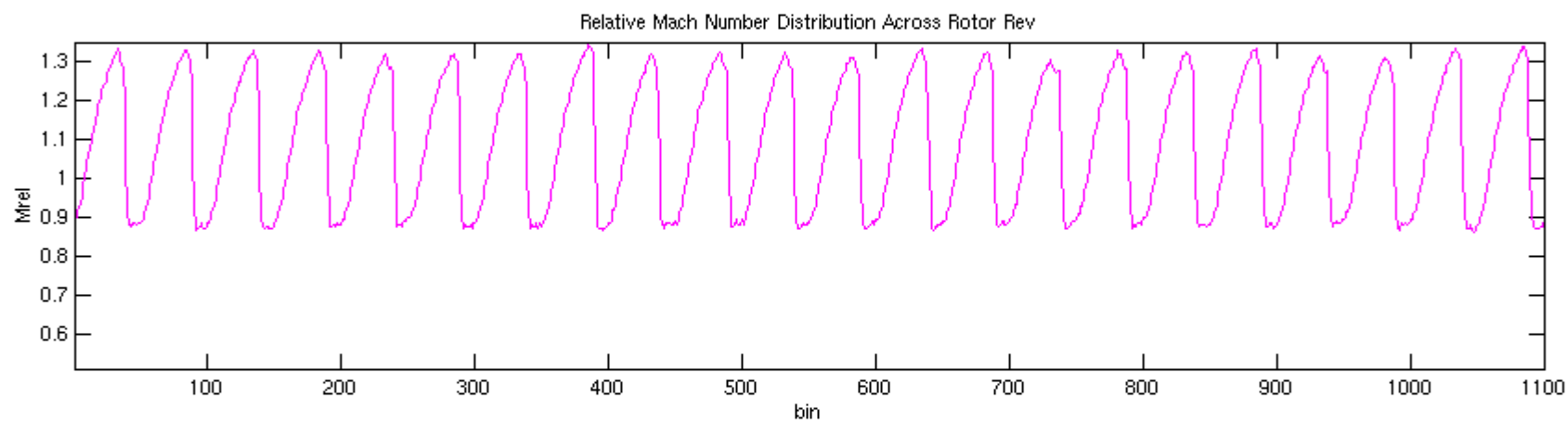
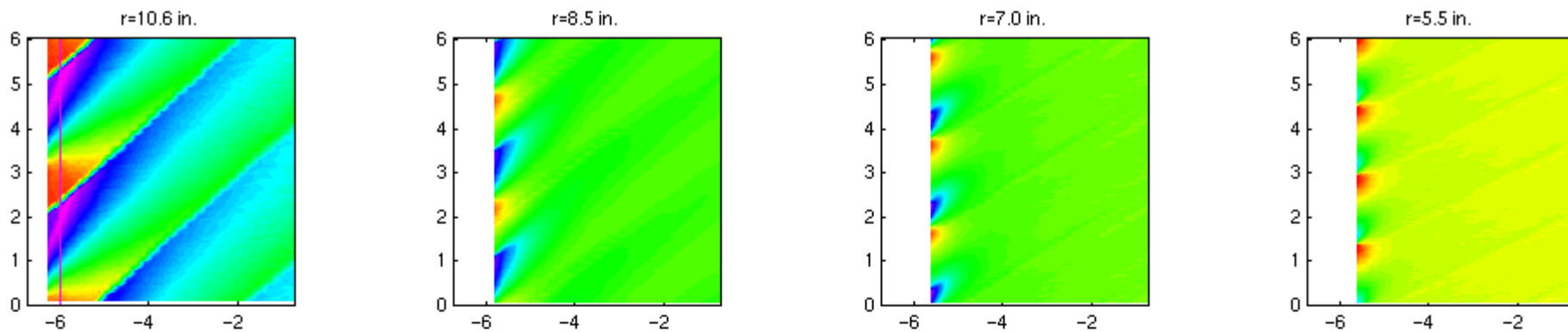


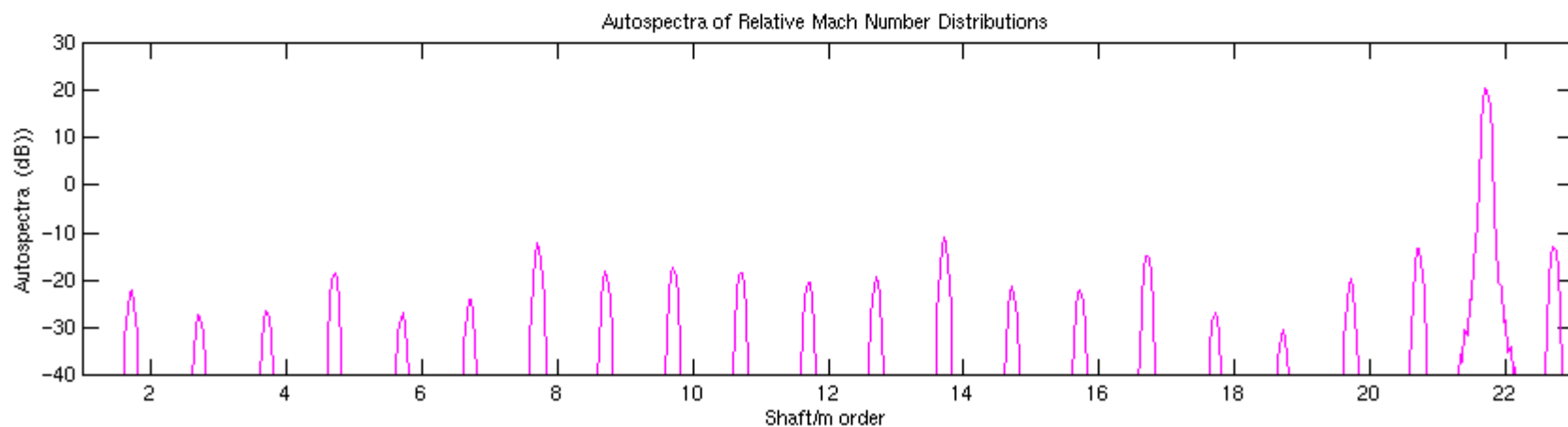
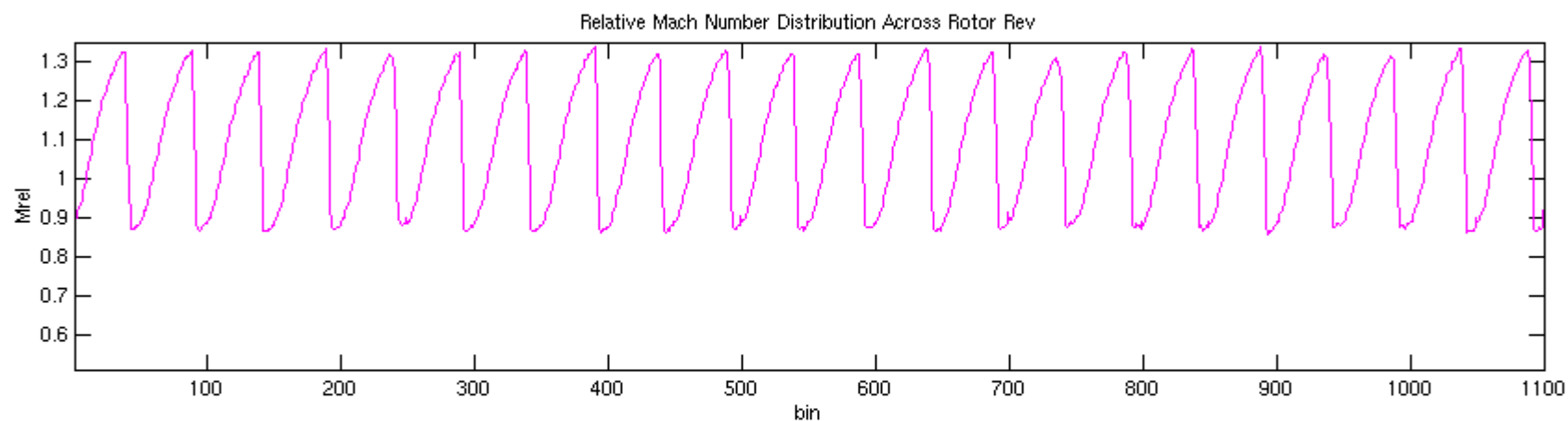
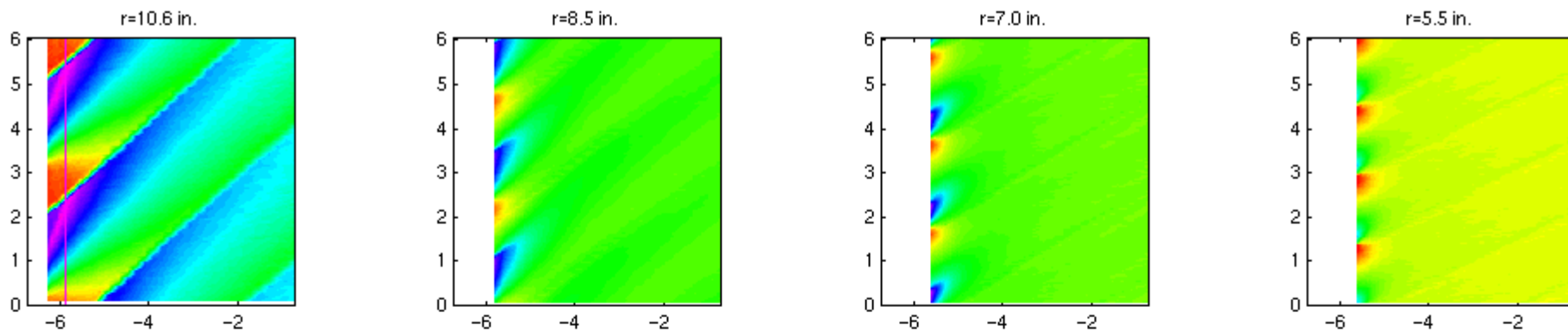
Figure 29.—Slideshow (34 slides) illustrating how the perturbation in the flow measured at four different radial locations upstream of the aft-swept fan varies with axial location at the mid-speed condition. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows autospectra computed from the relative Mach number distributions ($m = 22$ corresponds to the blade passing frequency). The solid lines overlaid on top of the color contour plots show the axial locations at which the data presented on that slide were acquired

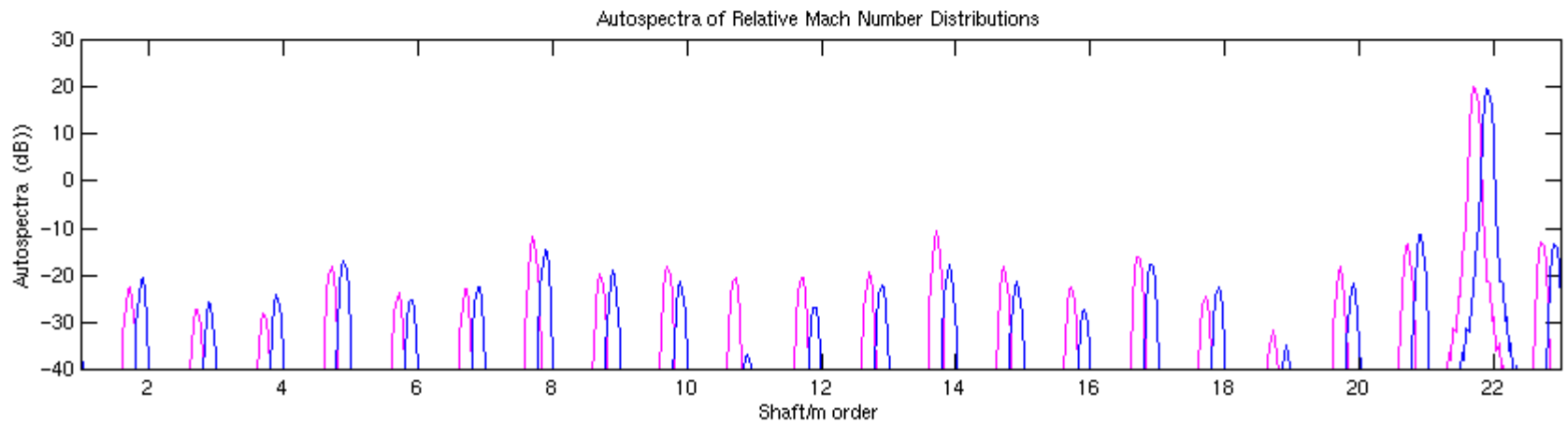
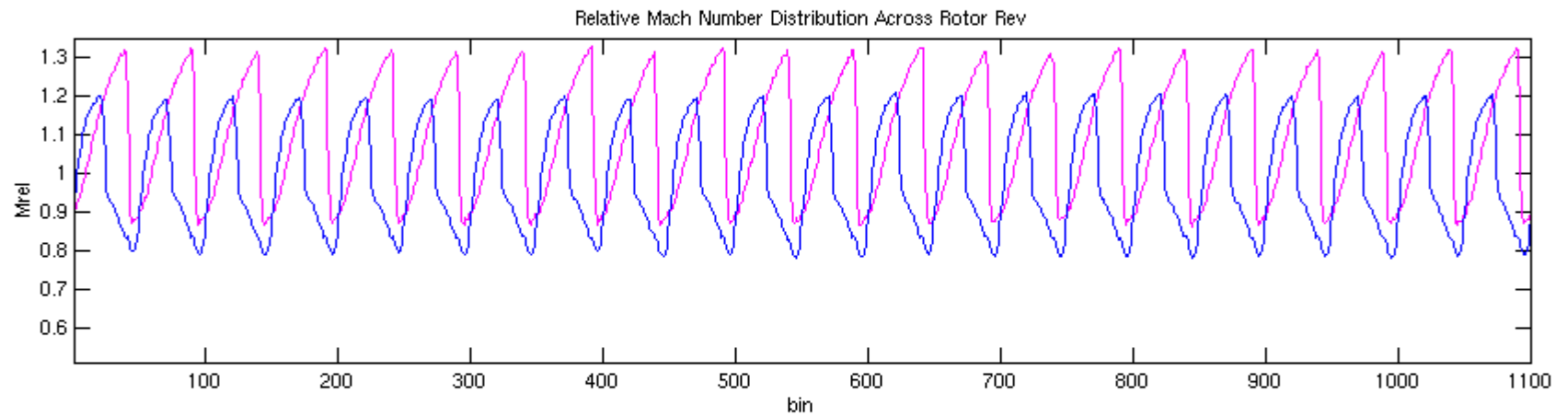
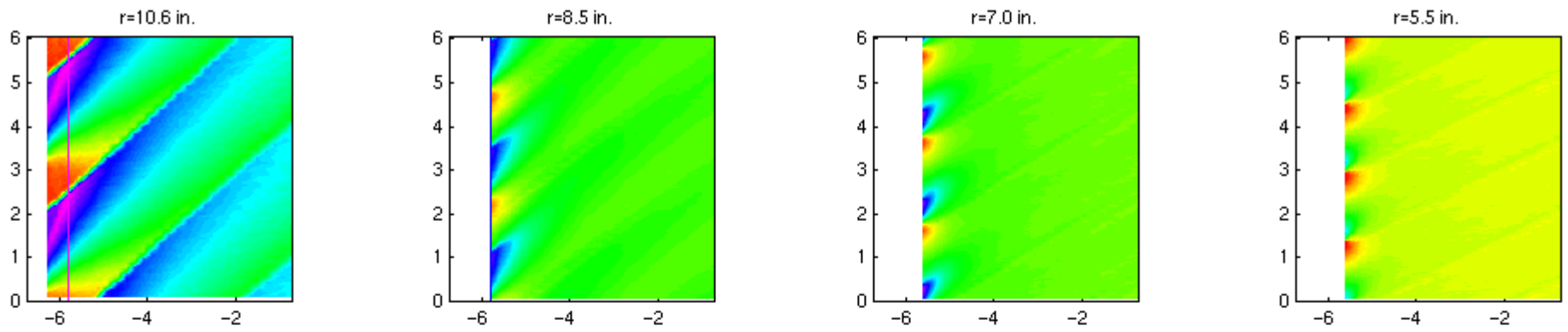


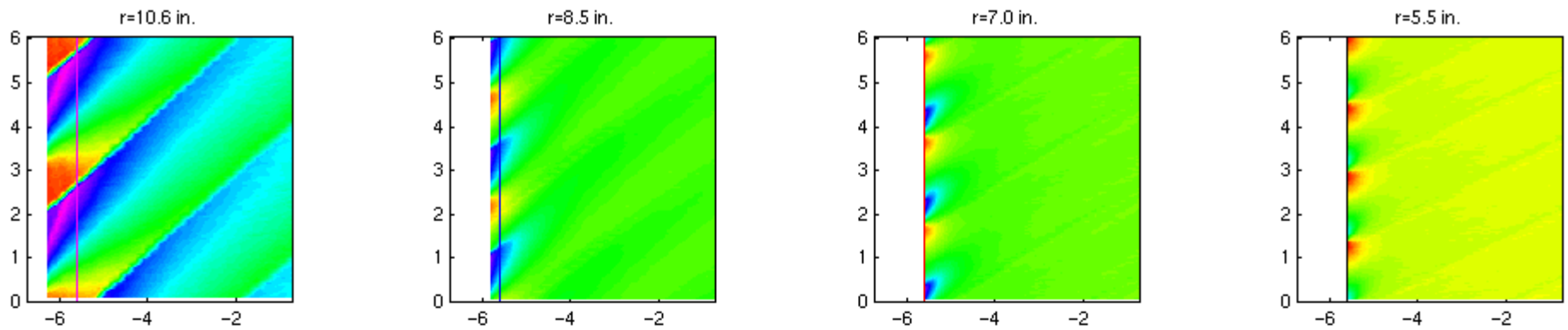




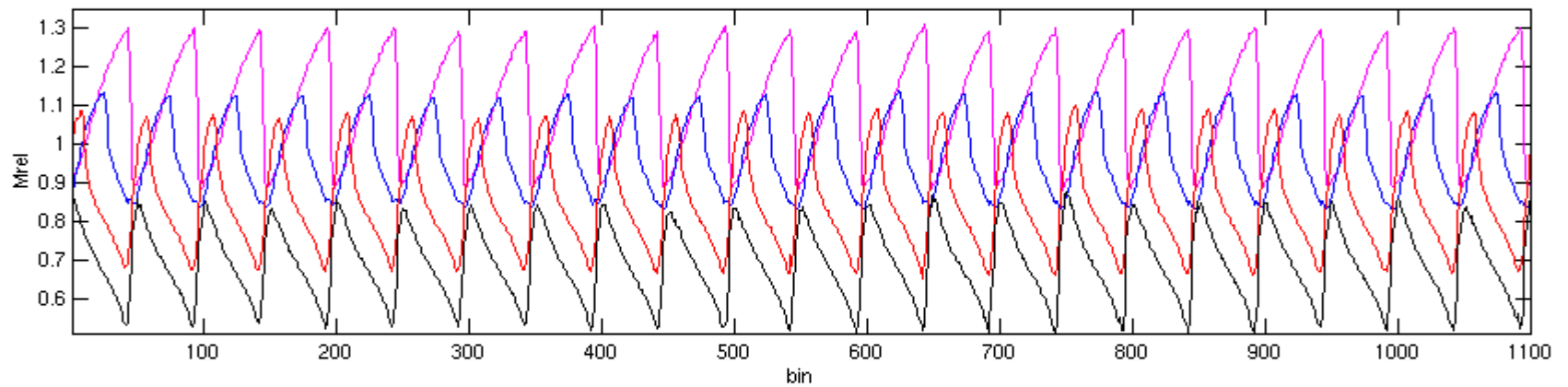




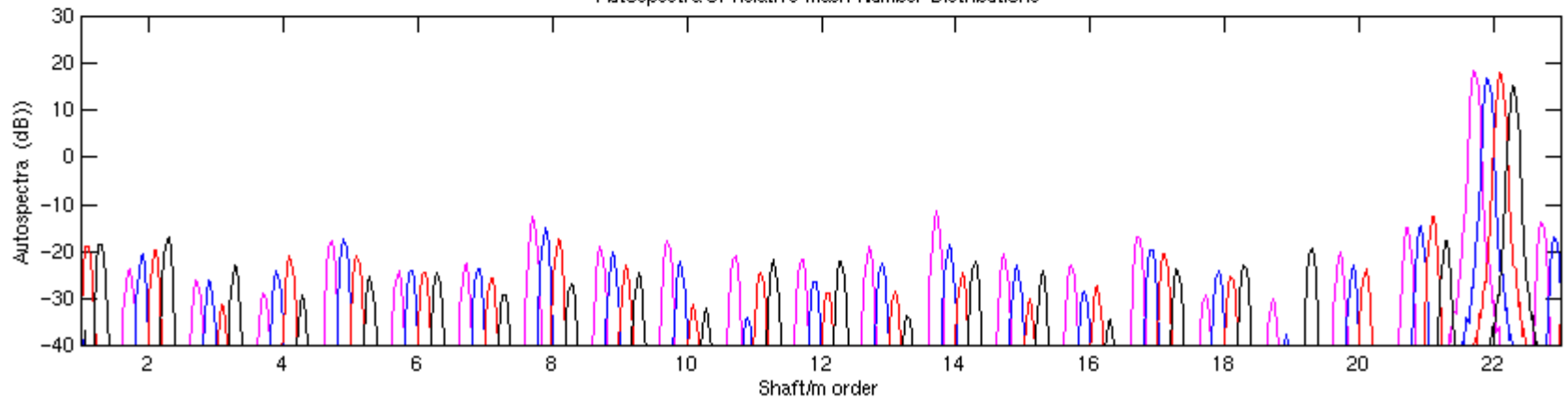


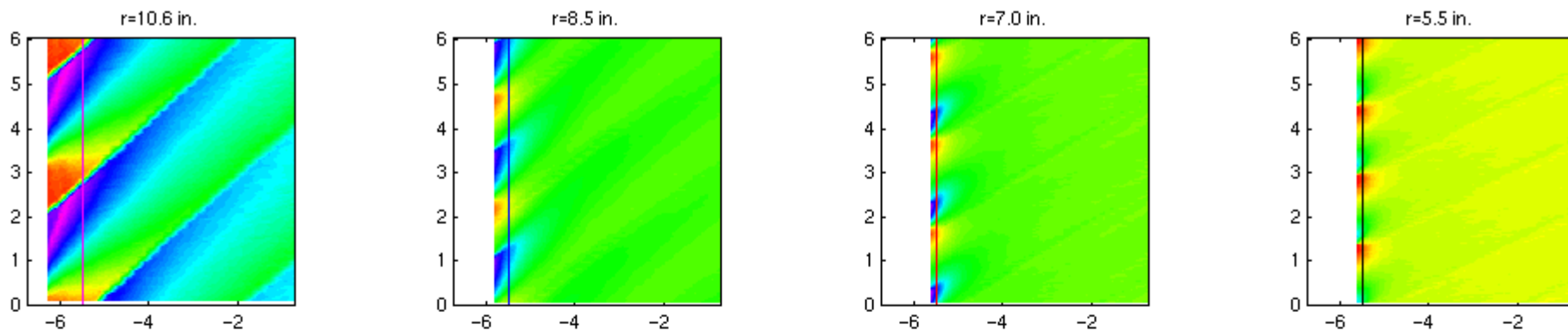


Relative Mach Number Distribution Across Rotor Rev

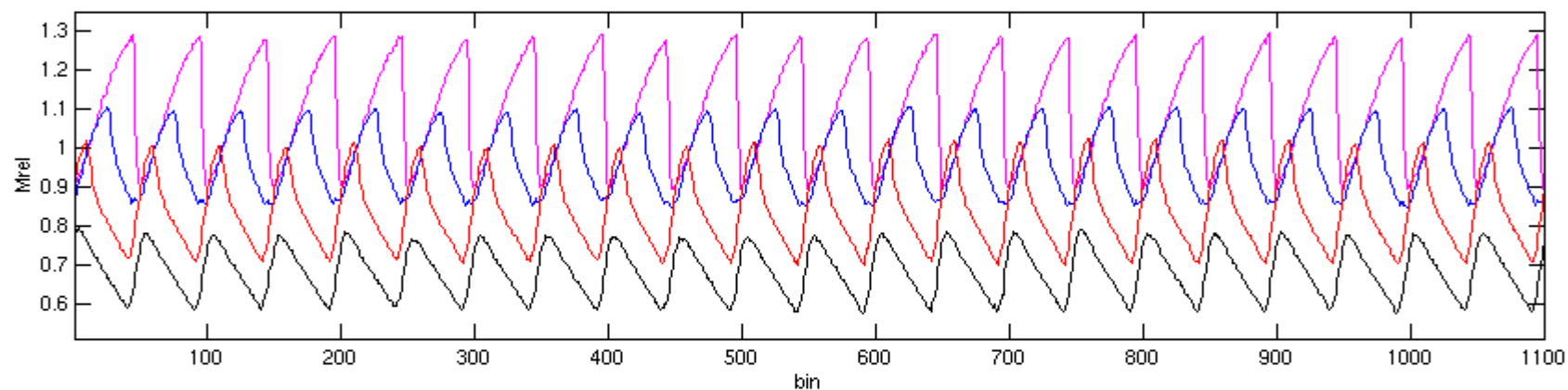


Autospectra of Relative Mach Number Distributions



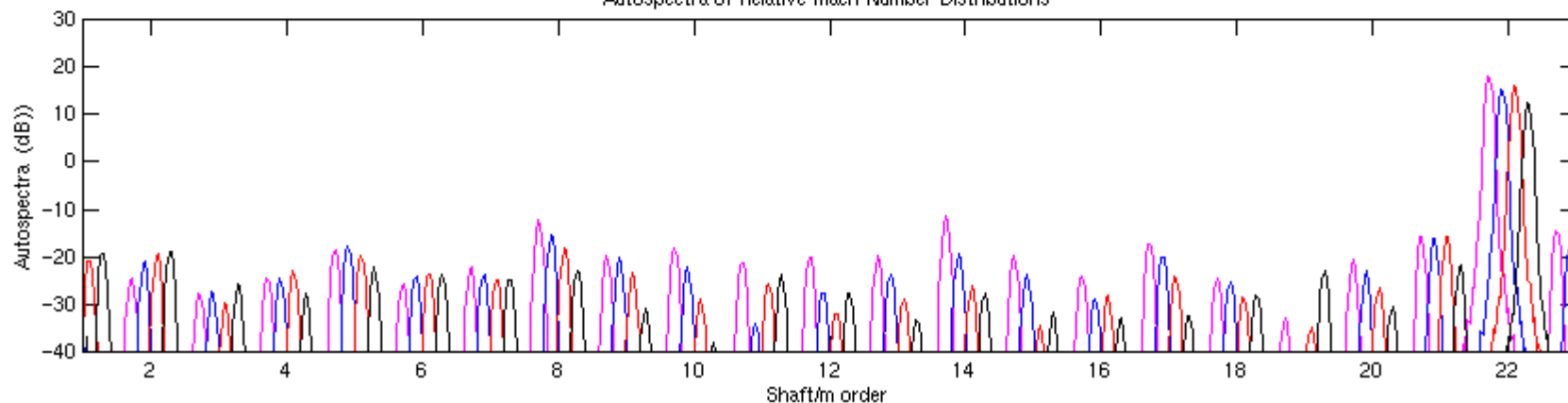


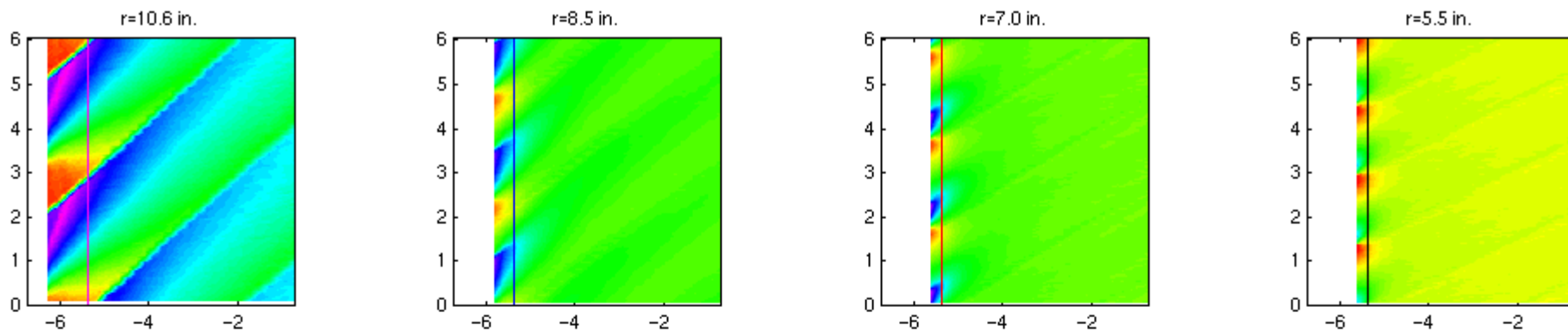
Relative Mach Number Distribution Across Rotor Rev



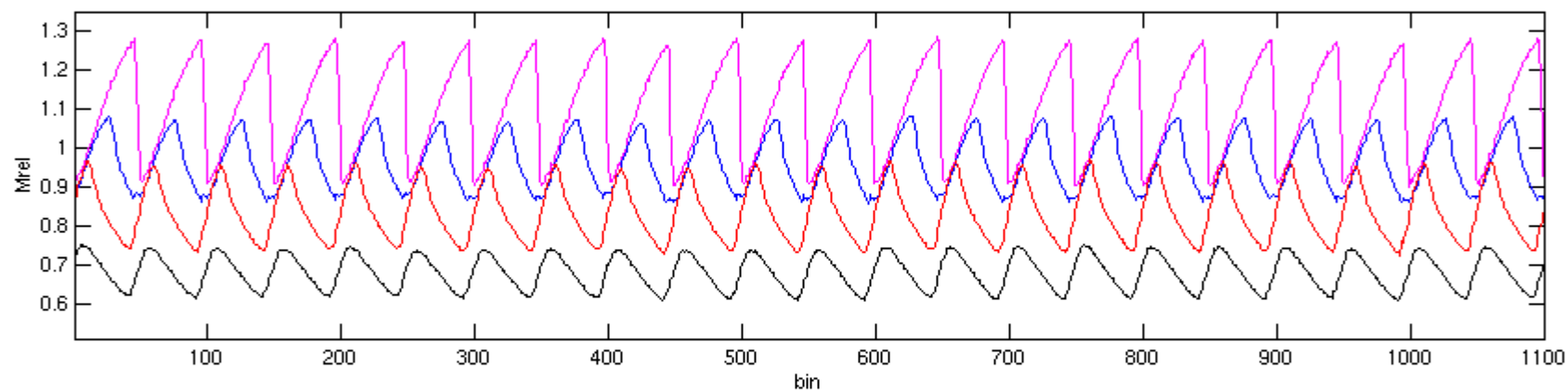
8

Autospectra of Relative Mach Number Distributions



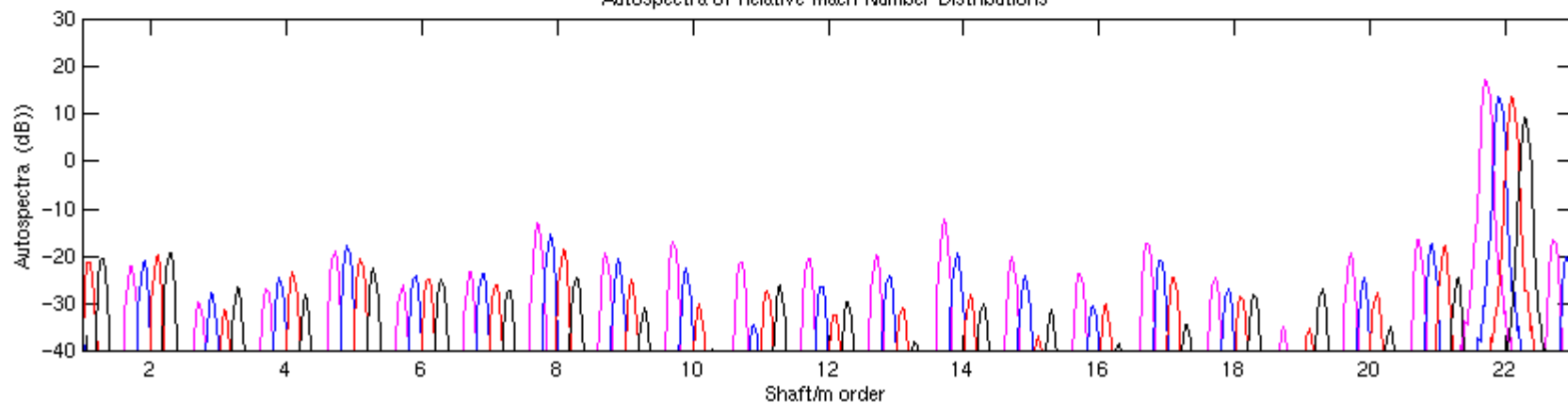


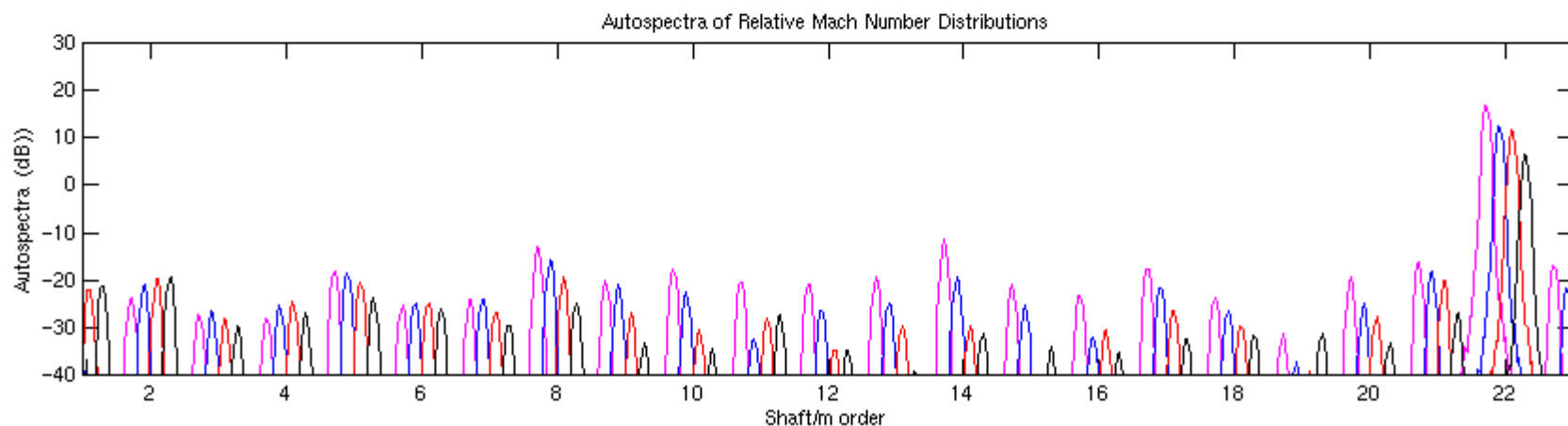
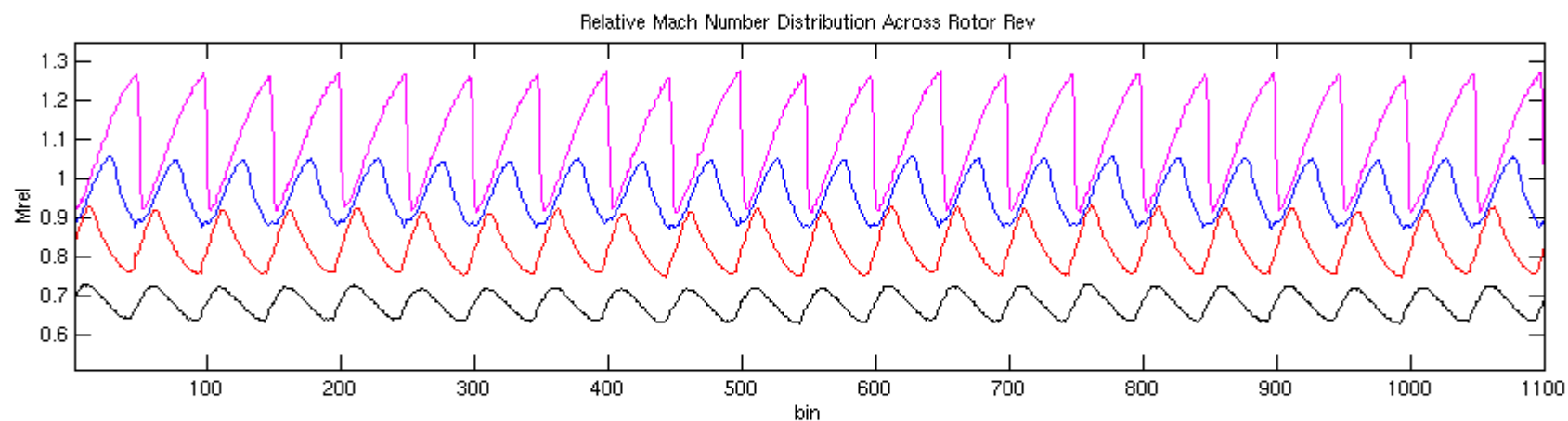
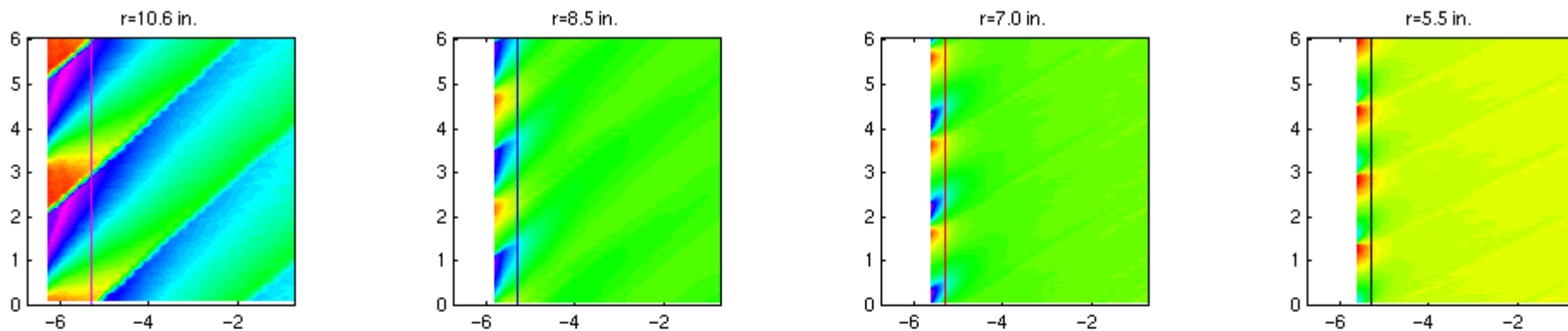
Relative Mach Number Distribution Across Rotor Rev

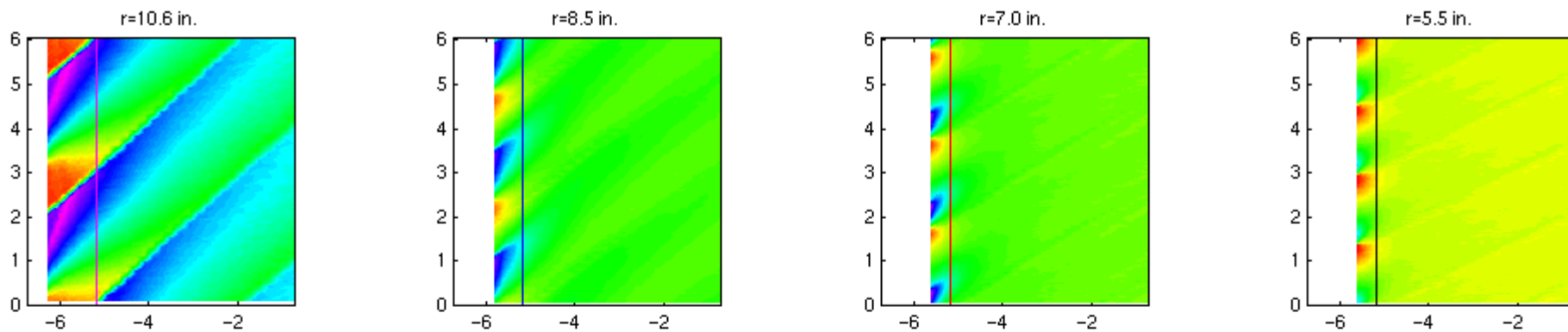


9

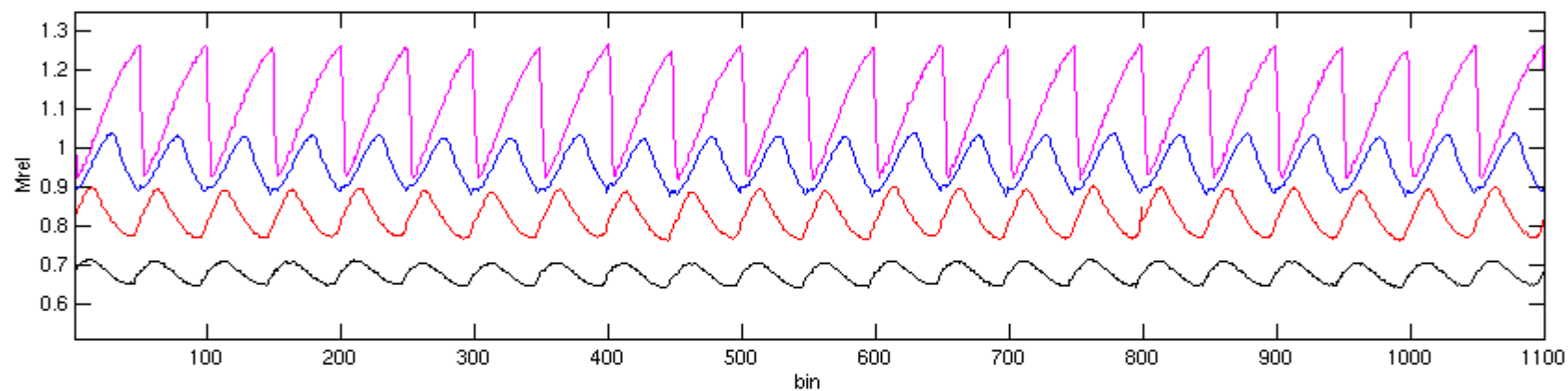
Autospectra of Relative Mach Number Distributions





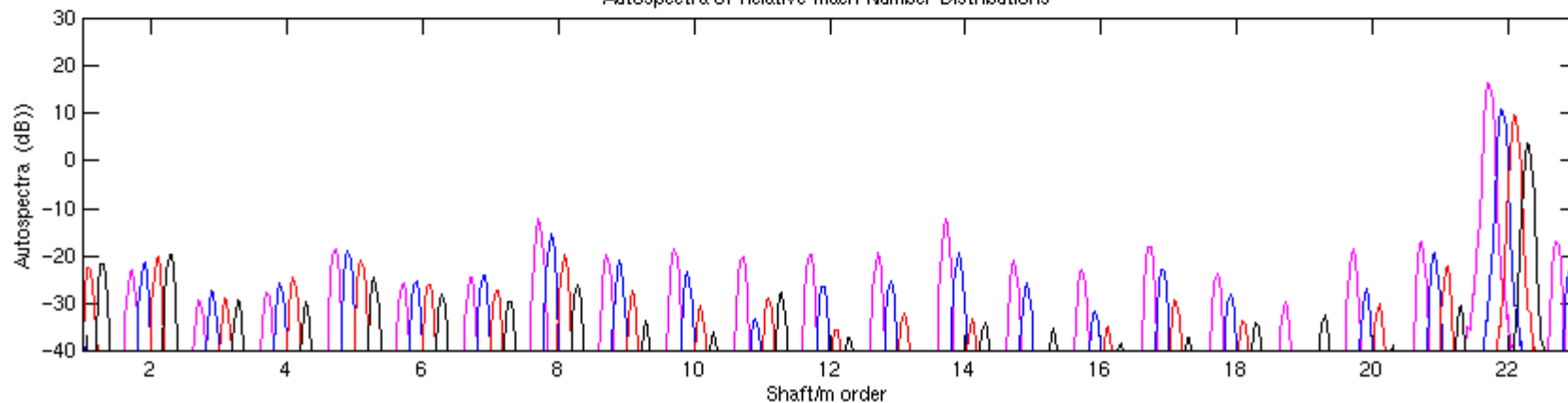


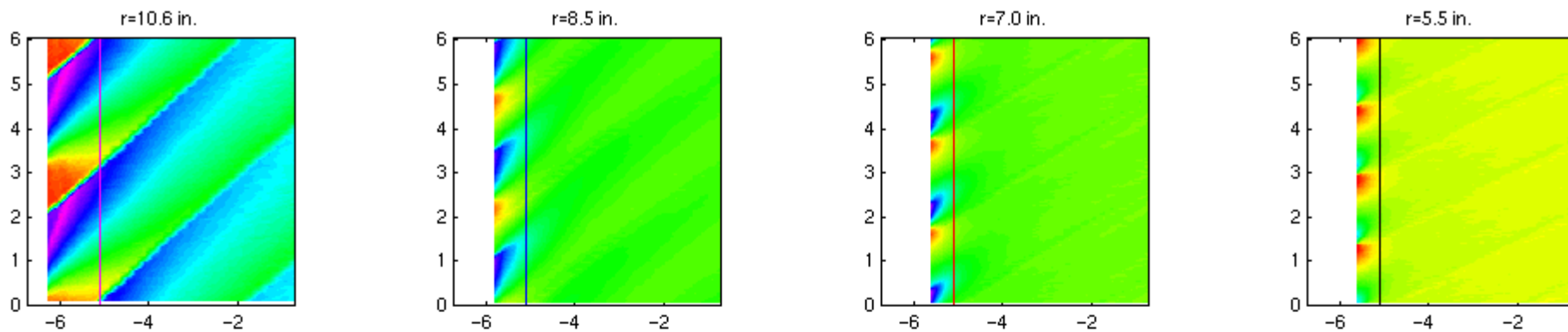
Relative Mach Number Distribution Across Rotor Rev



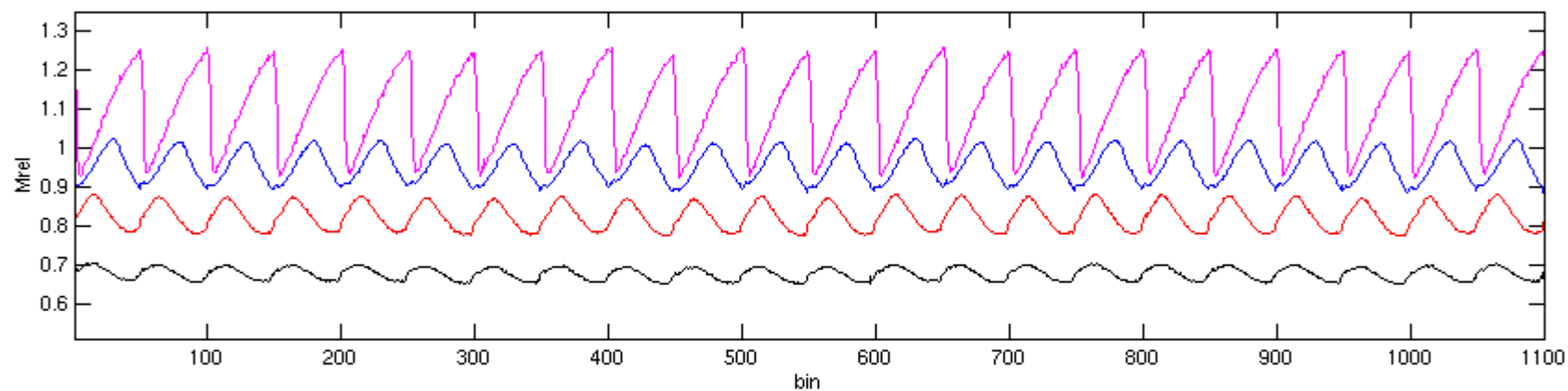
11

Autospectra of Relative Mach Number Distributions



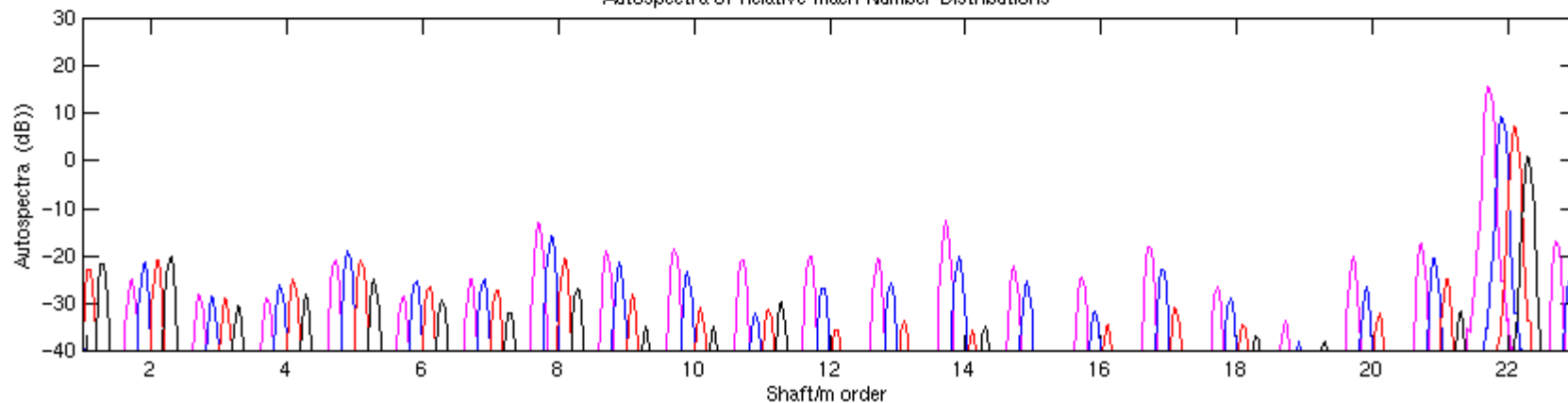


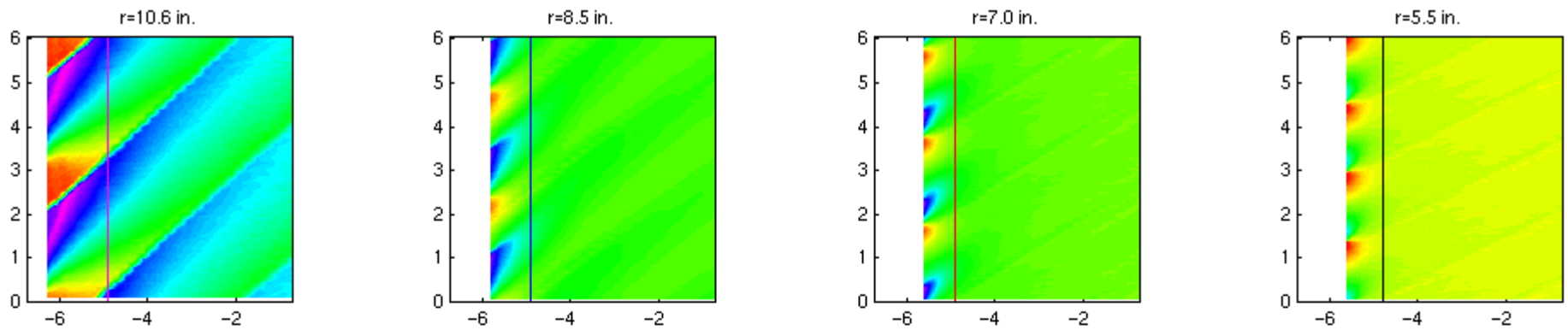
Relative Mach Number Distribution Across Rotor Rev



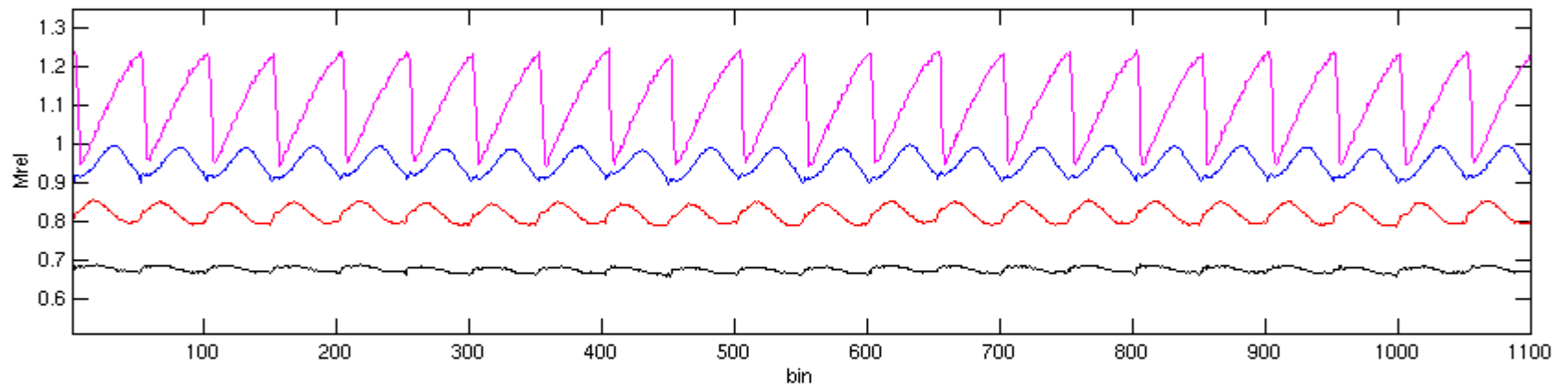
12

Autospectra of Relative Mach Number Distributions



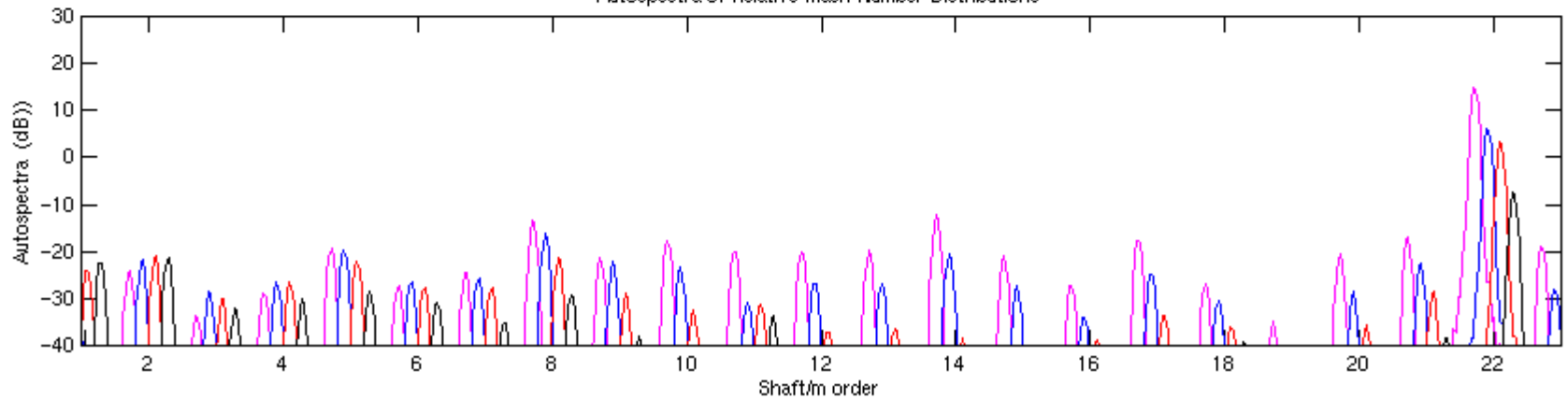


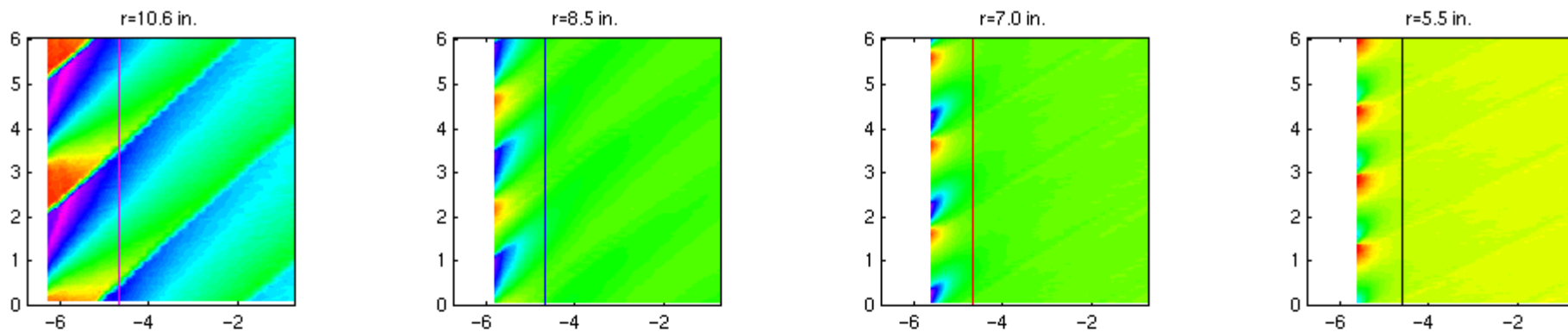
Relative Mach Number Distribution Across Rotor Rev



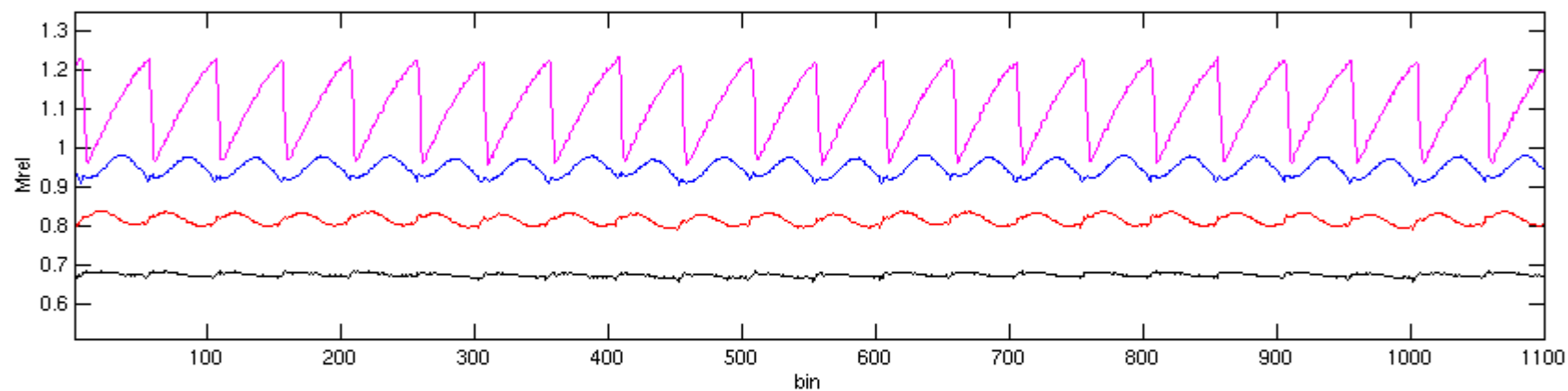
13

Autospectra of Relative Mach Number Distributions



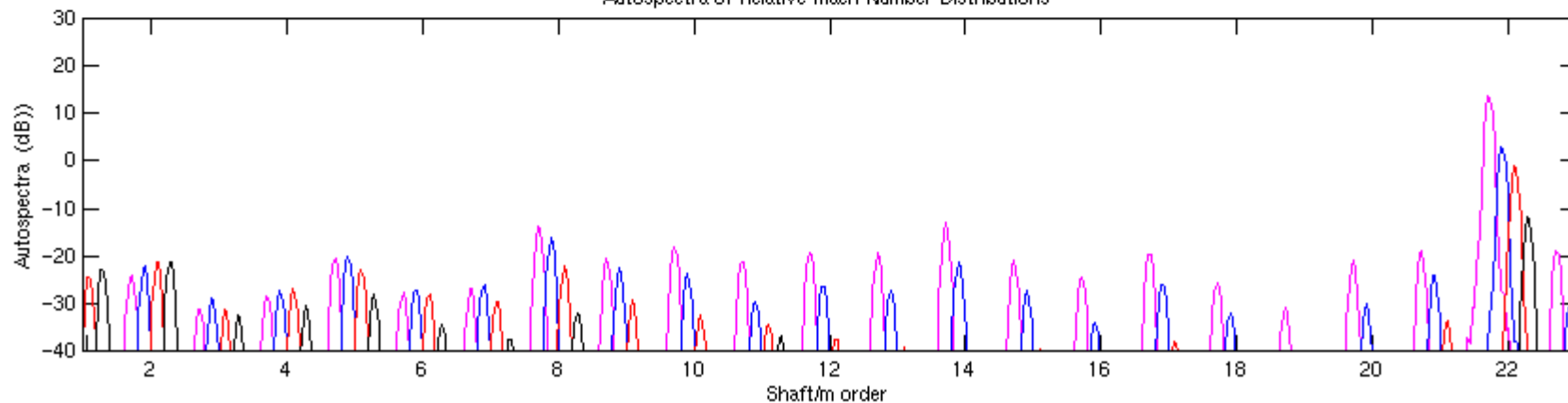


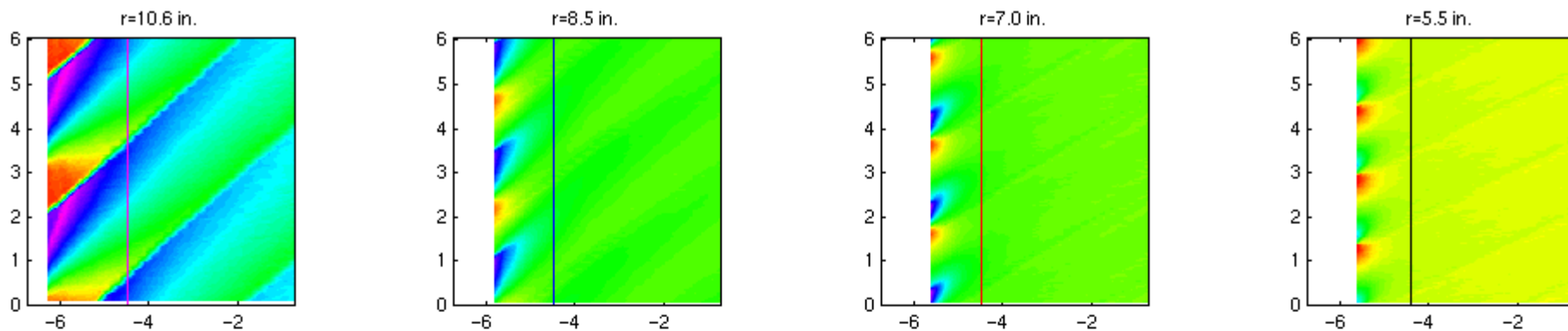
Relative Mach Number Distribution Across Rotor Rev



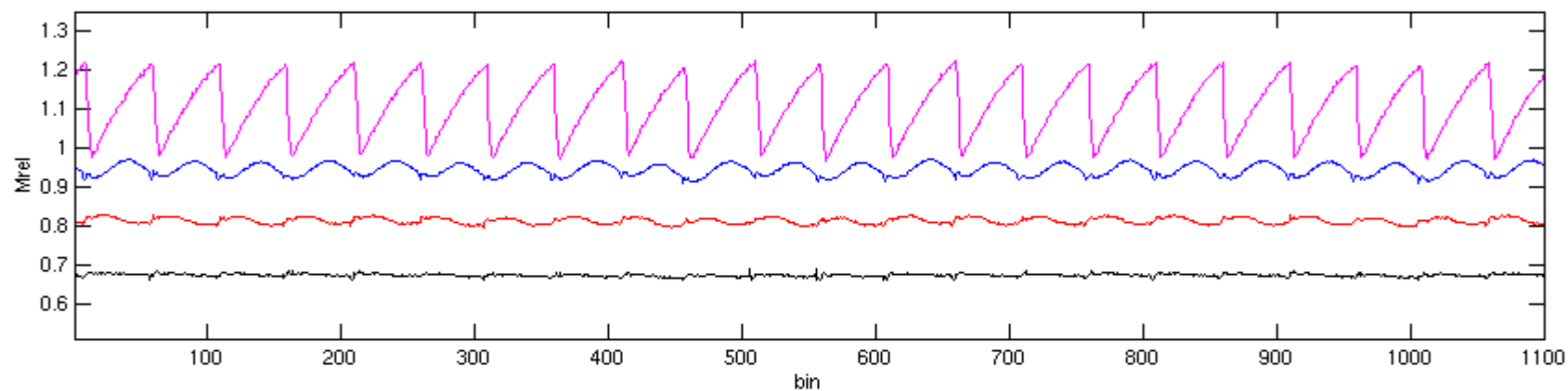
14

Autospectra of Relative Mach Number Distributions



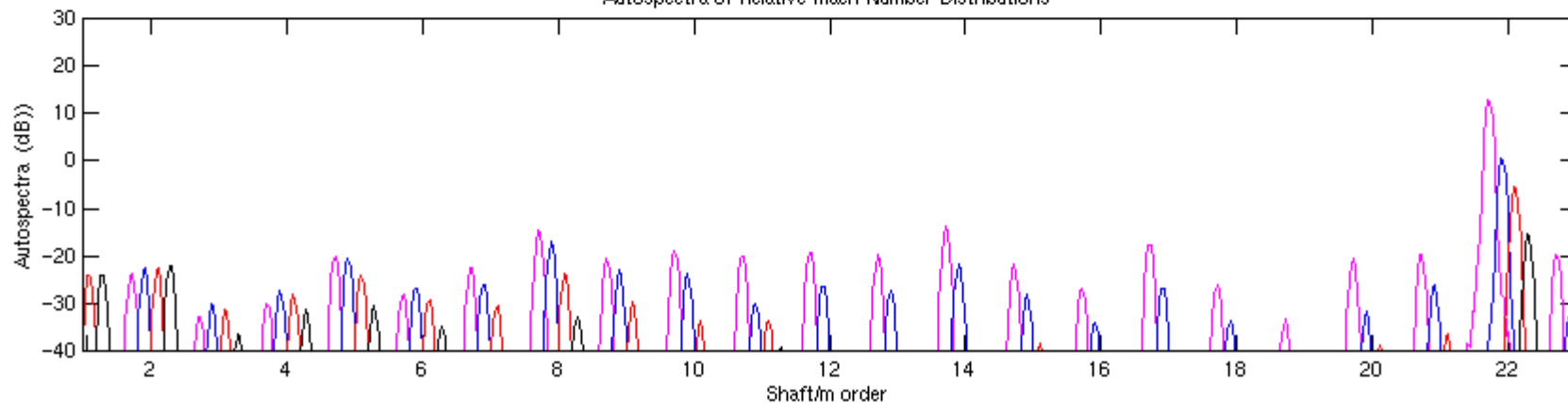


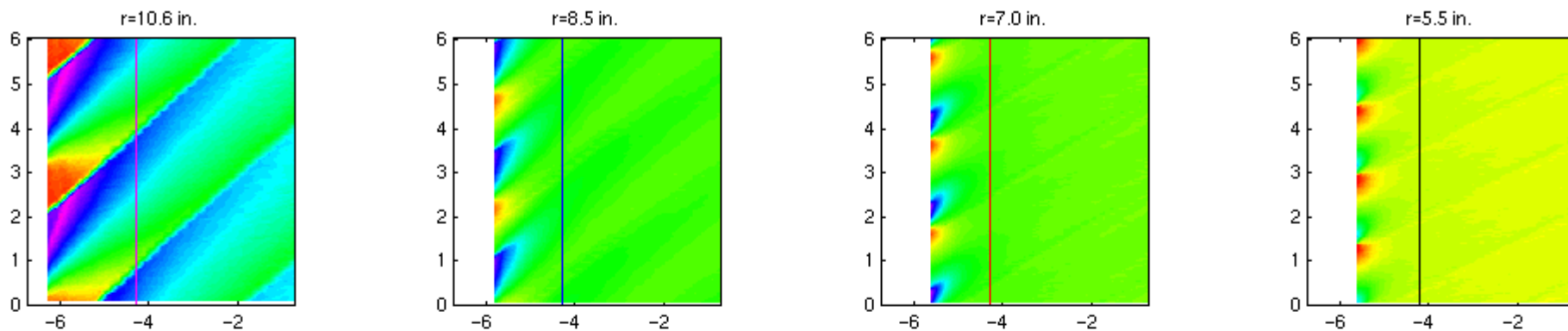
Relative Mach Number Distribution Across Rotor Rev



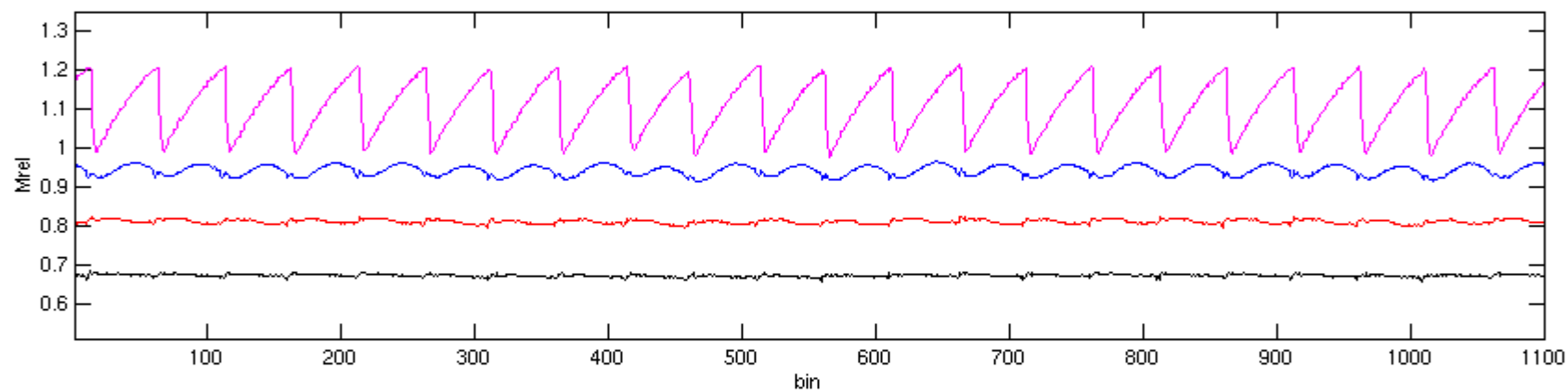
15

Autospectra of Relative Mach Number Distributions



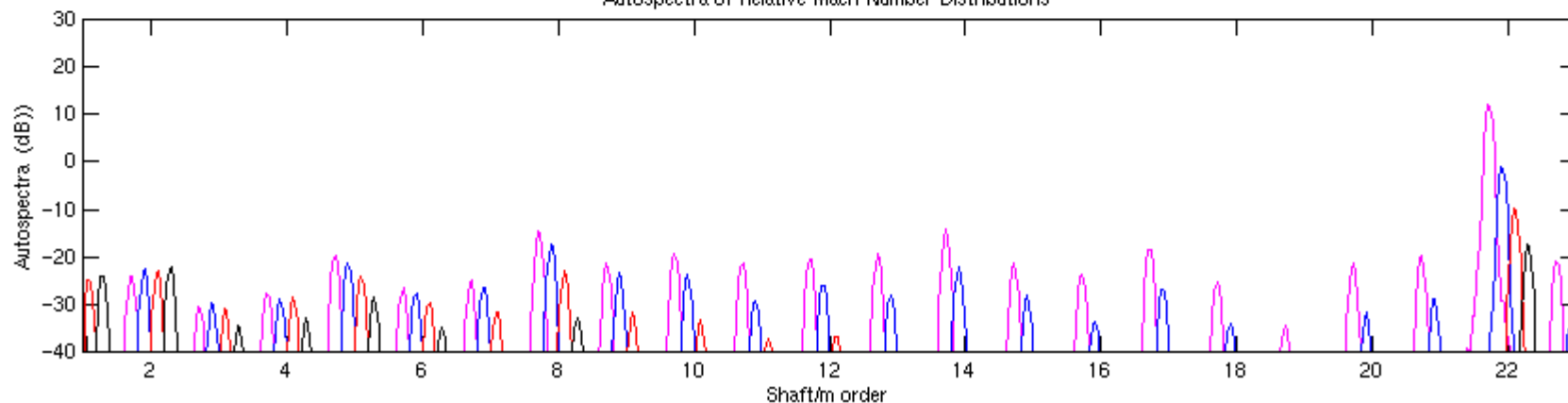


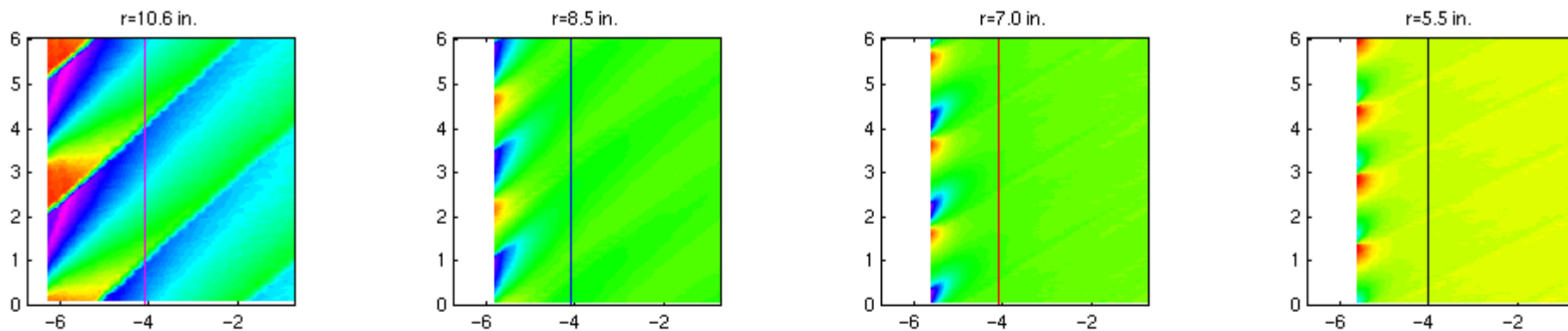
Relative Mach Number Distribution Across Rotor Rev



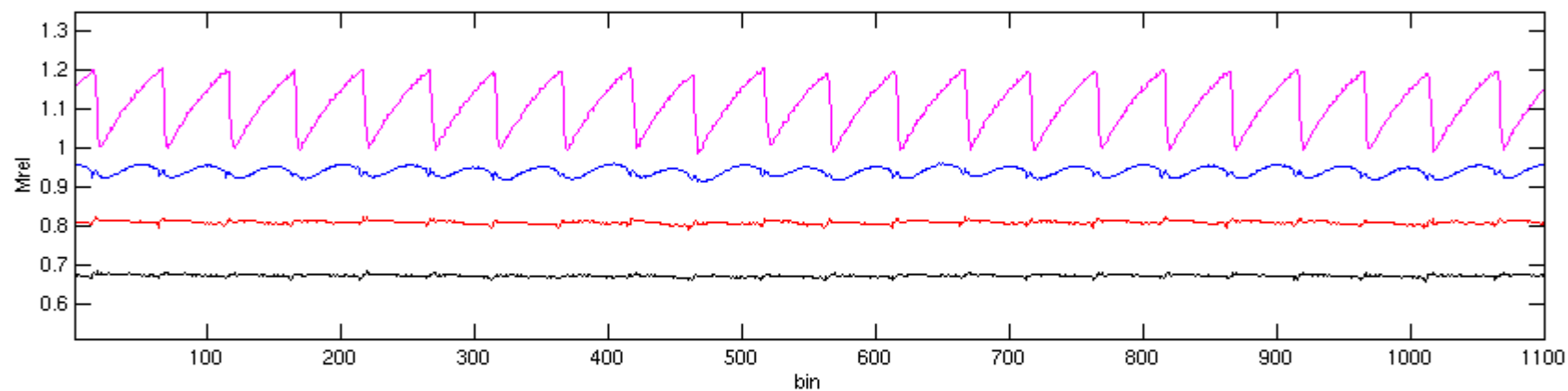
16

Autospectra of Relative Mach Number Distributions



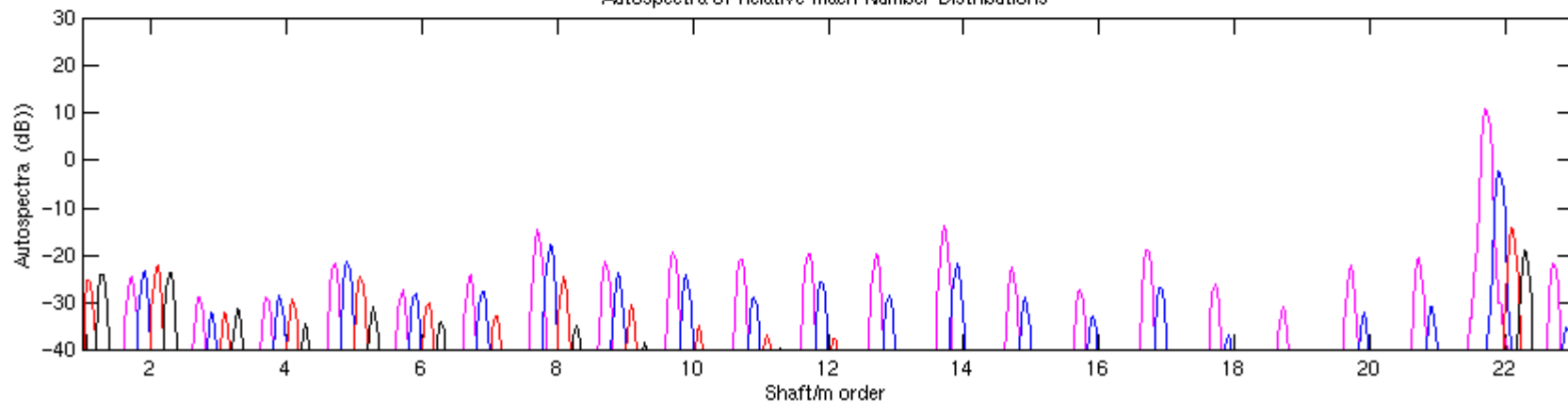


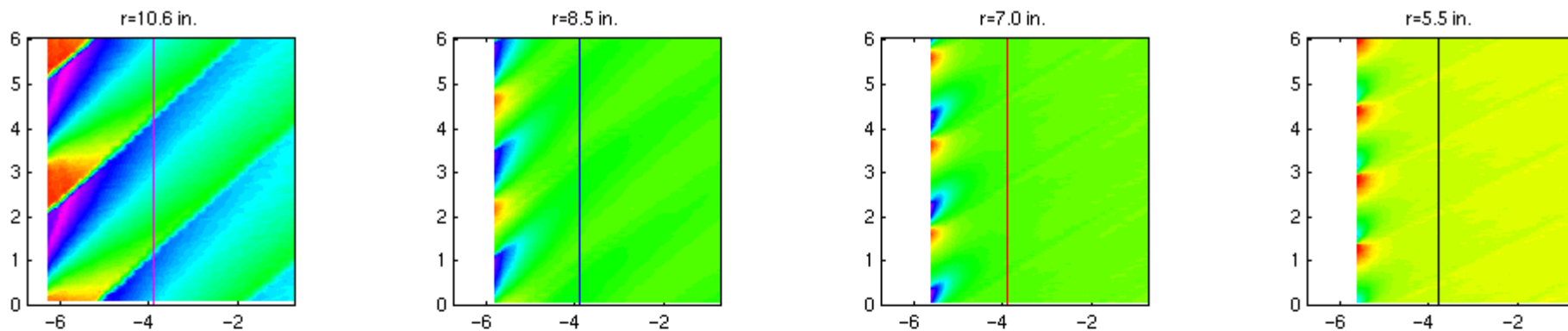
Relative Mach Number Distribution Across Rotor Rev



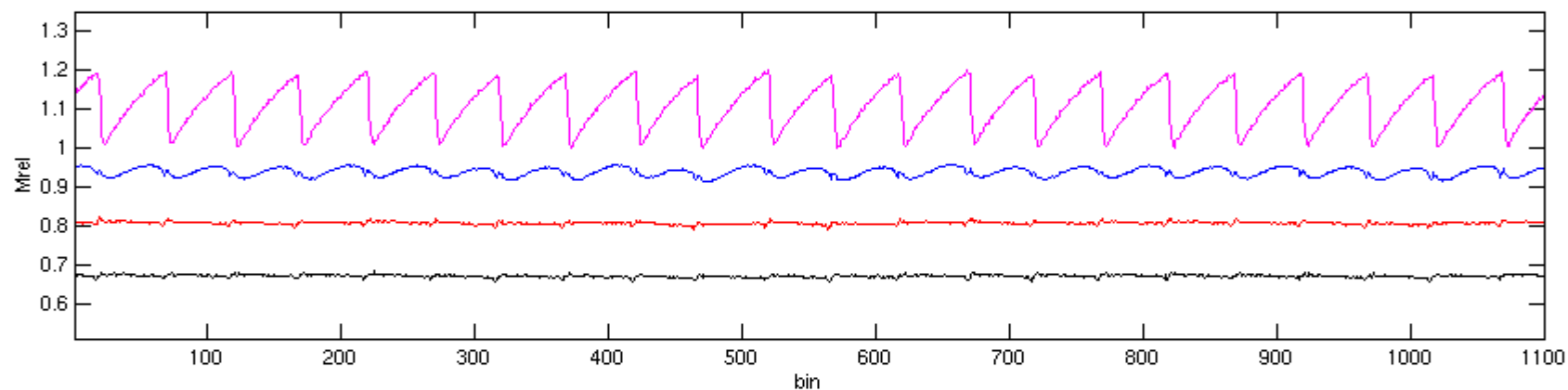
17

Autospectra of Relative Mach Number Distributions



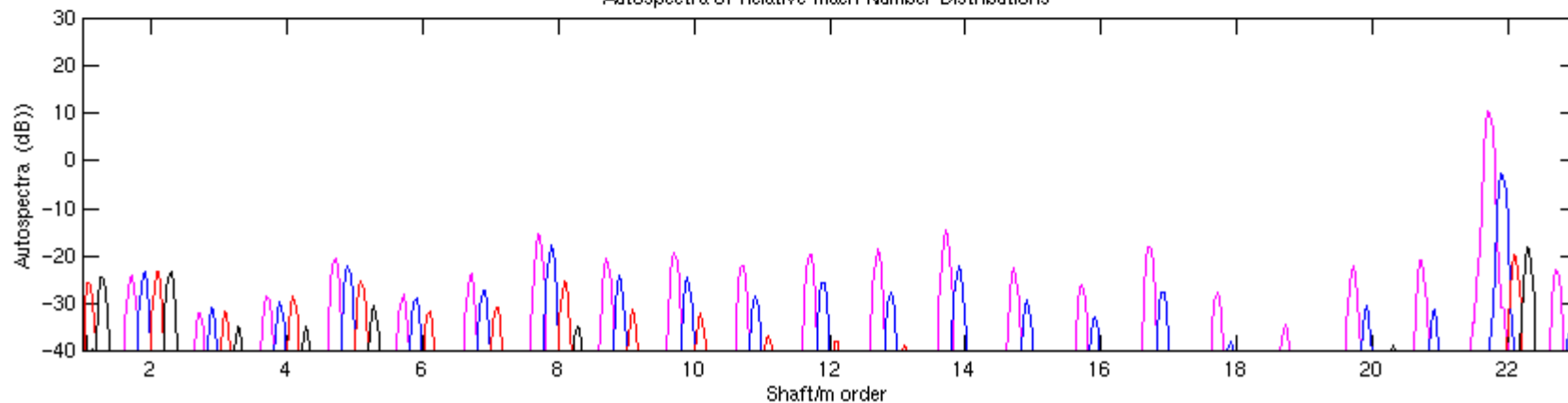


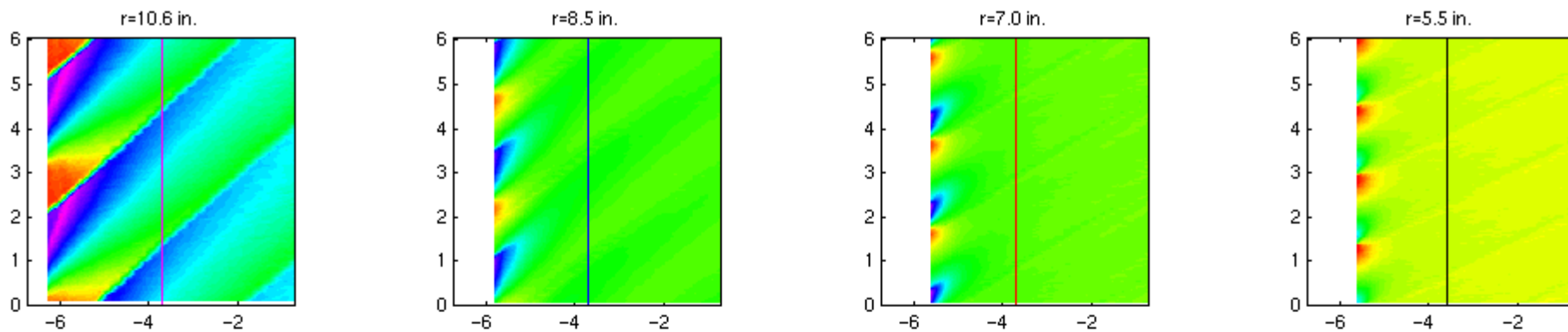
Relative Mach Number Distribution Across Rotor Rev



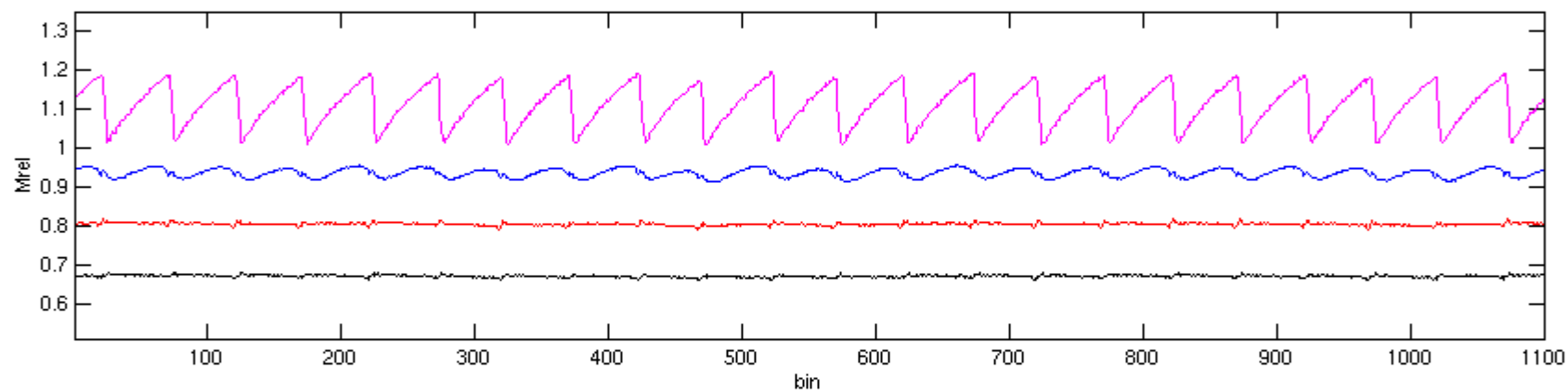
18

Autospectra of Relative Mach Number Distributions



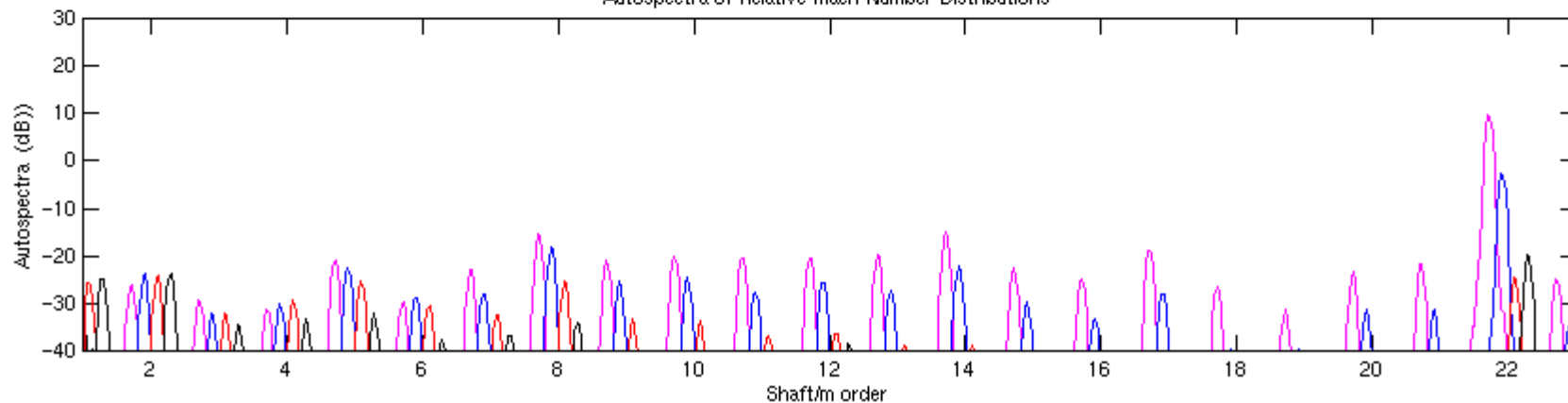


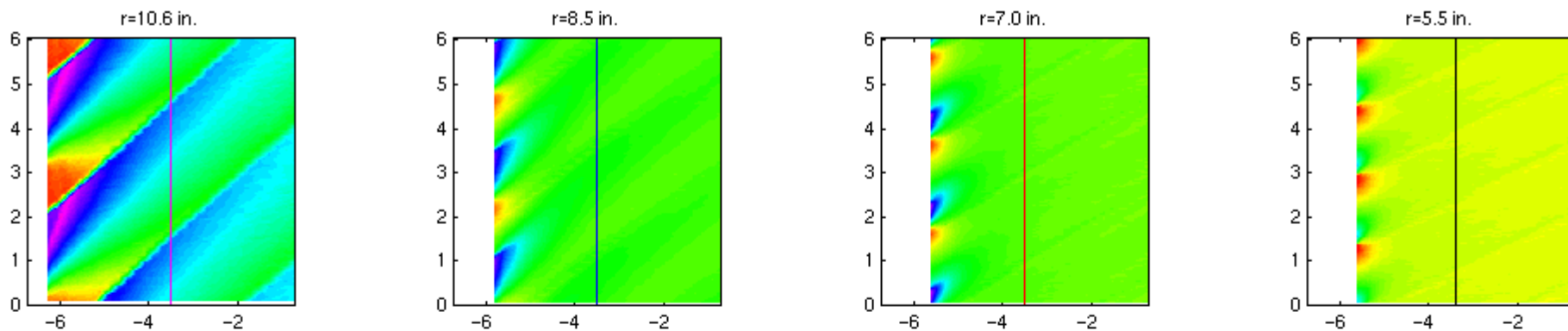
Relative Mach Number Distribution Across Rotor Rev



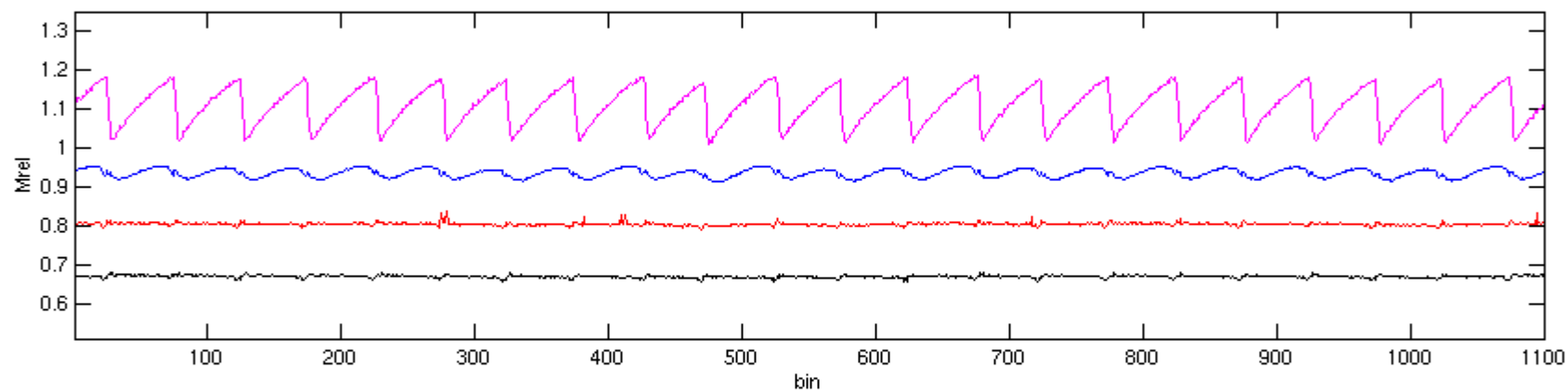
19

Autospectra of Relative Mach Number Distributions



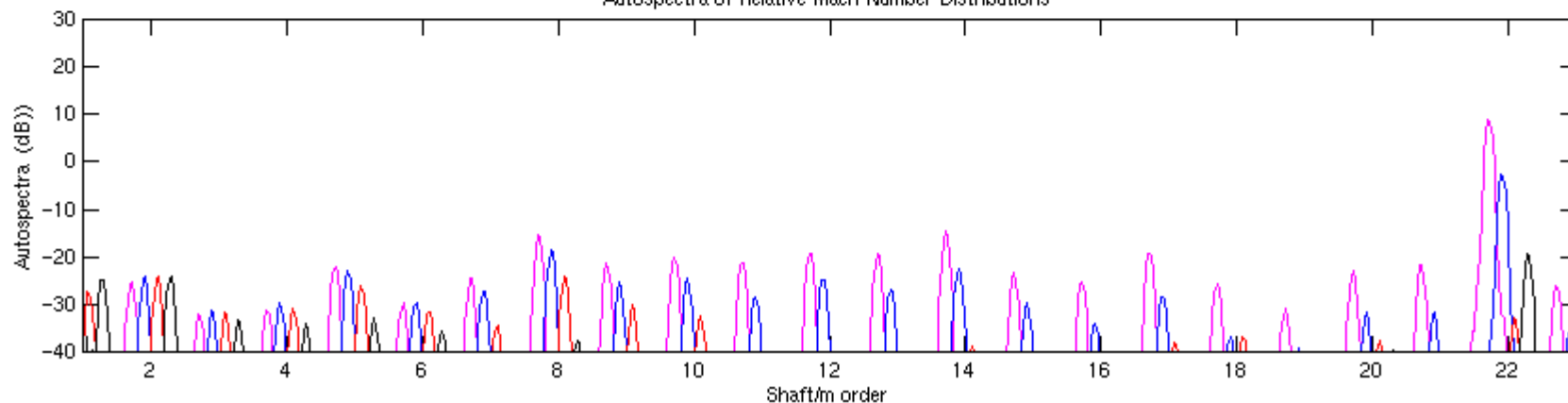


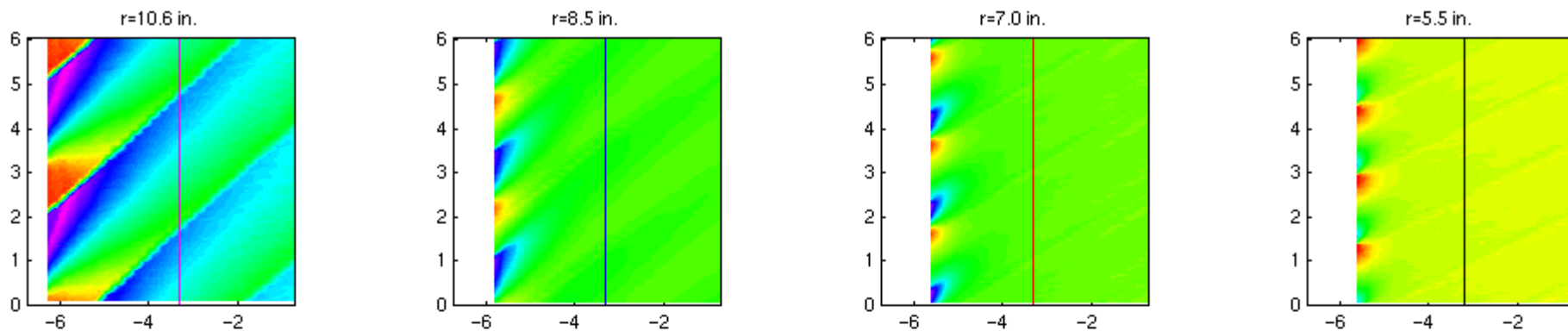
Relative Mach Number Distribution Across Rotor Rev



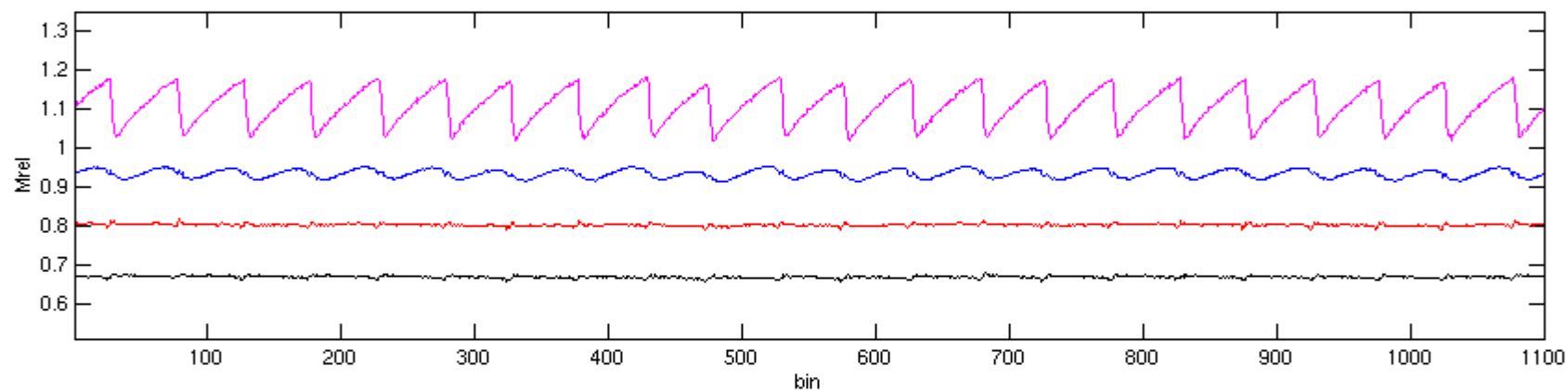
20

Autospectra of Relative Mach Number Distributions



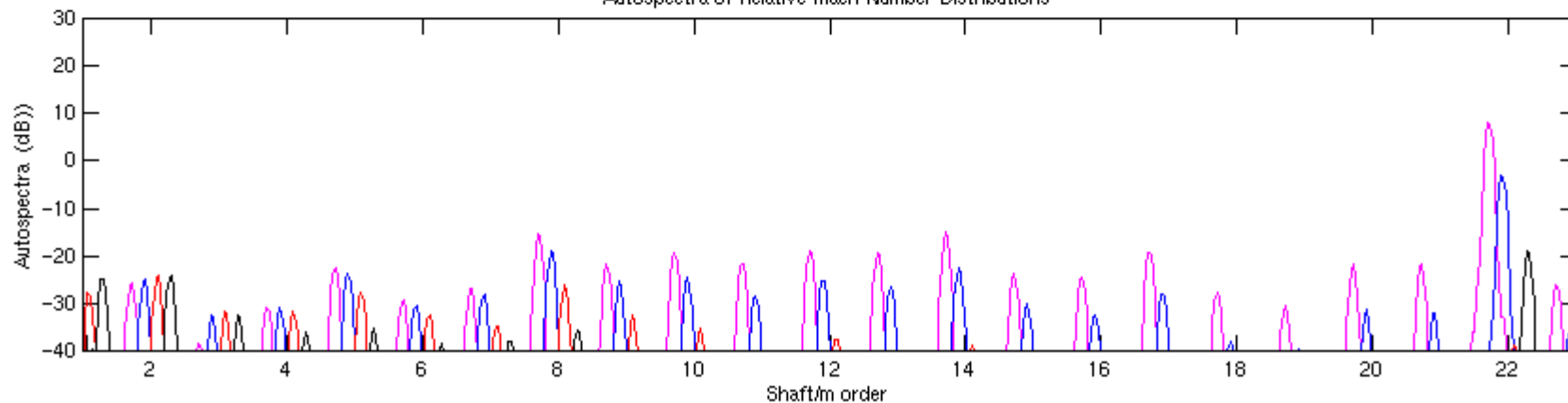


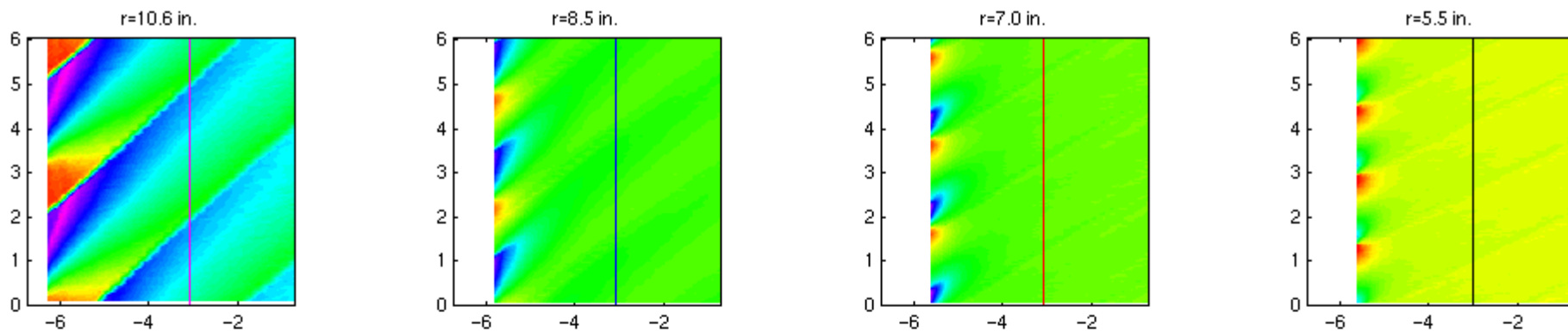
Relative Mach Number Distribution Across Rotor Rev



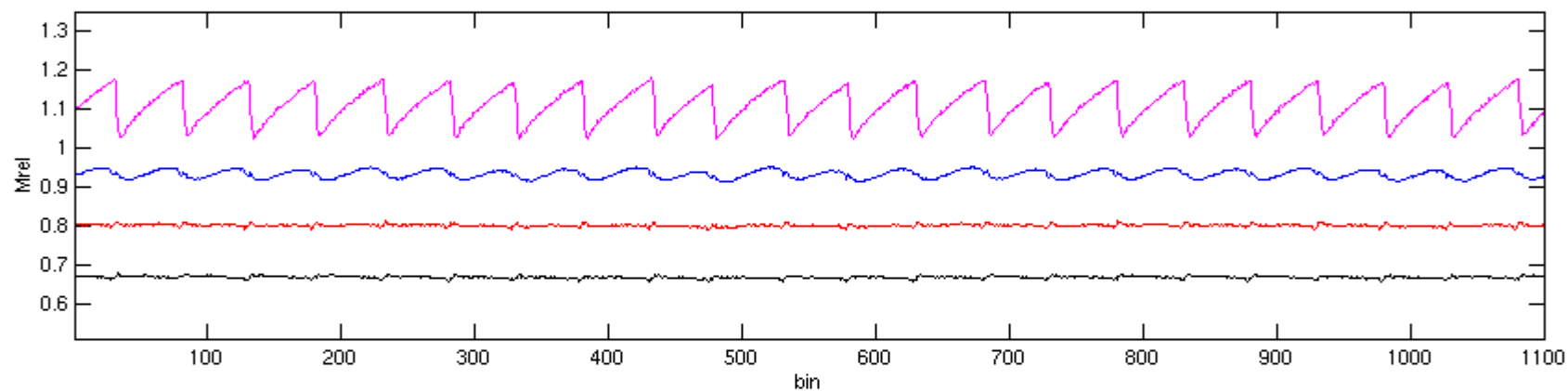
21

Autospectra of Relative Mach Number Distributions



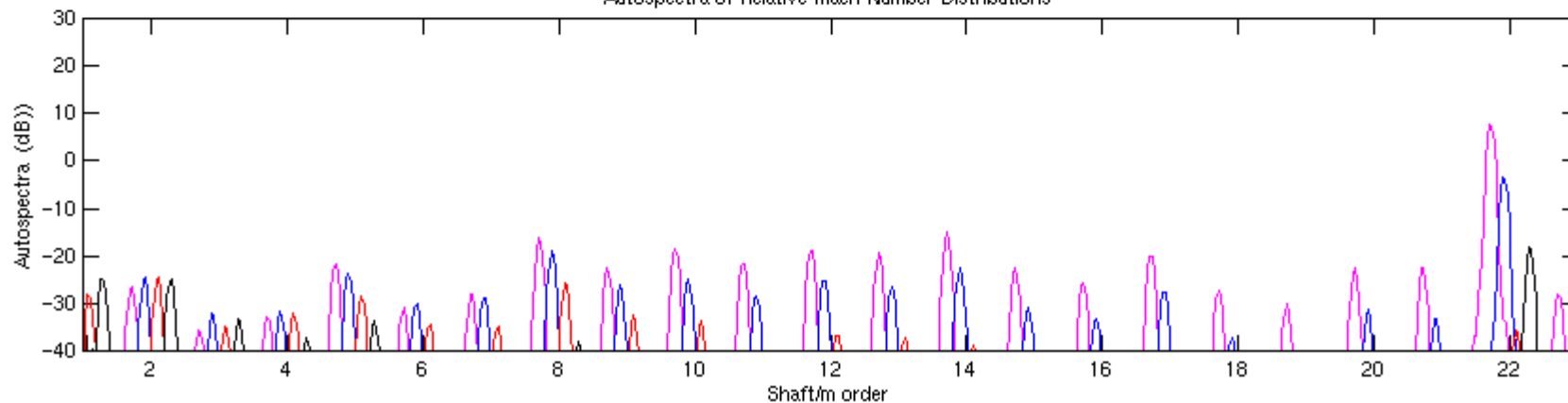


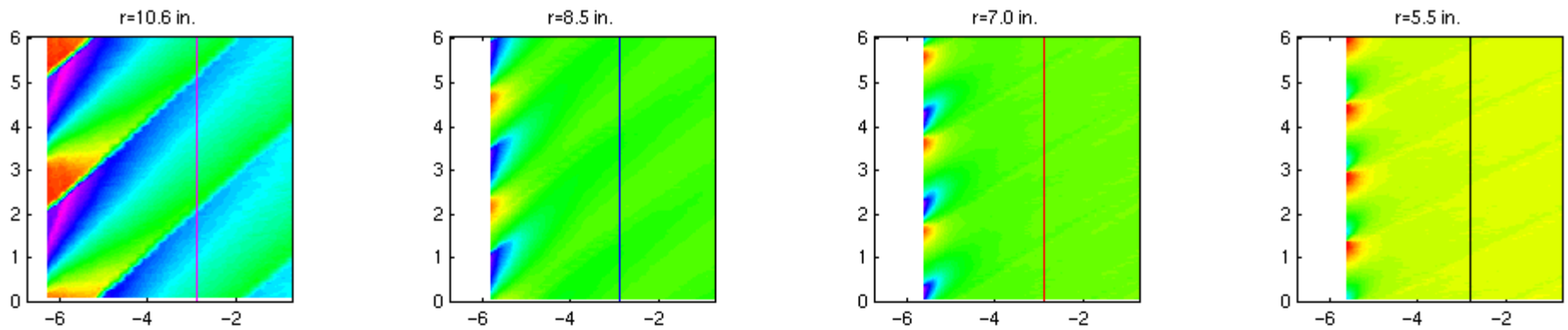
Relative Mach Number Distribution Across Rotor Rev



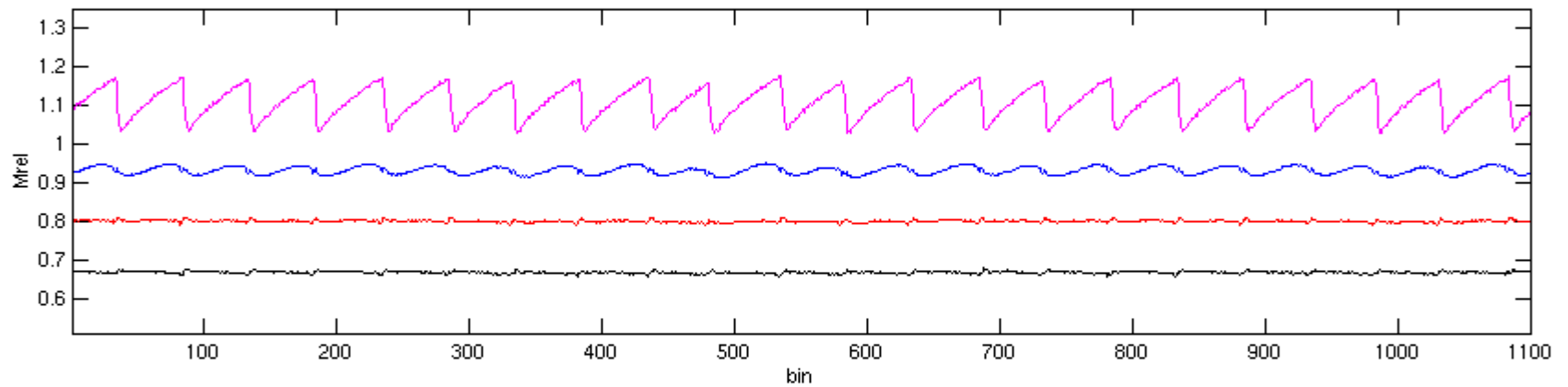
22

Autospectra of Relative Mach Number Distributions



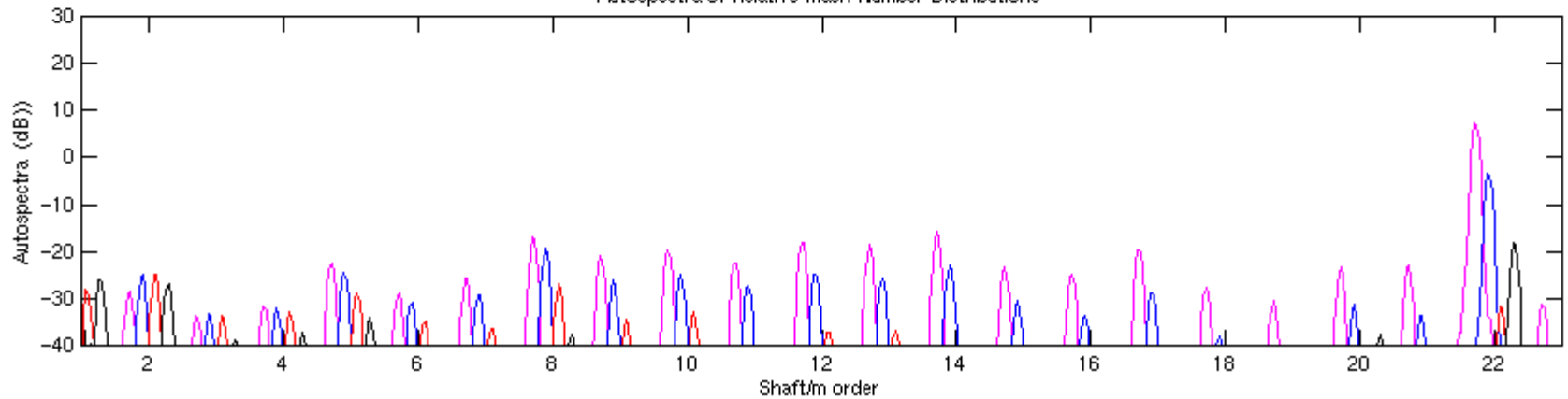


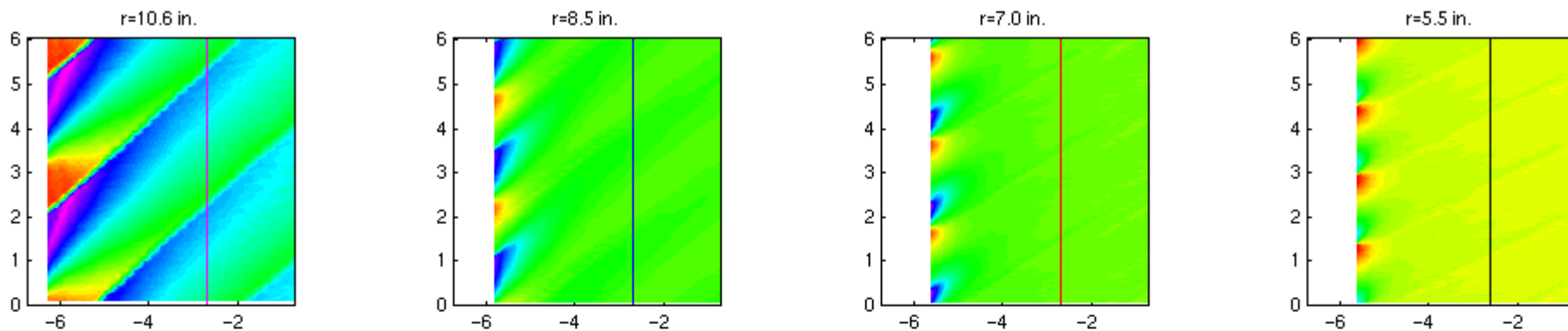
Relative Mach Number Distribution Across Rotor Rev



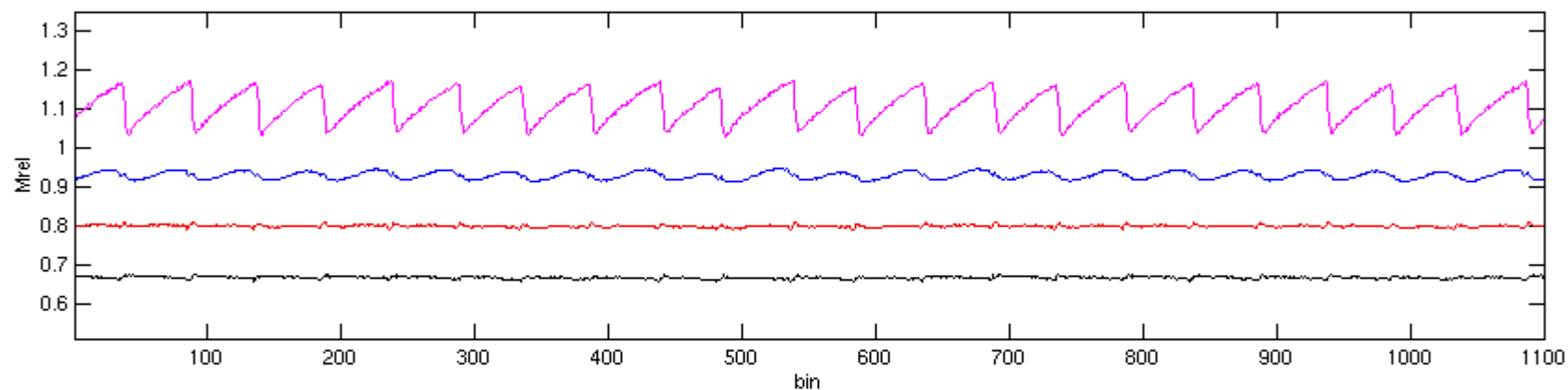
23

Autospectra of Relative Mach Number Distributions



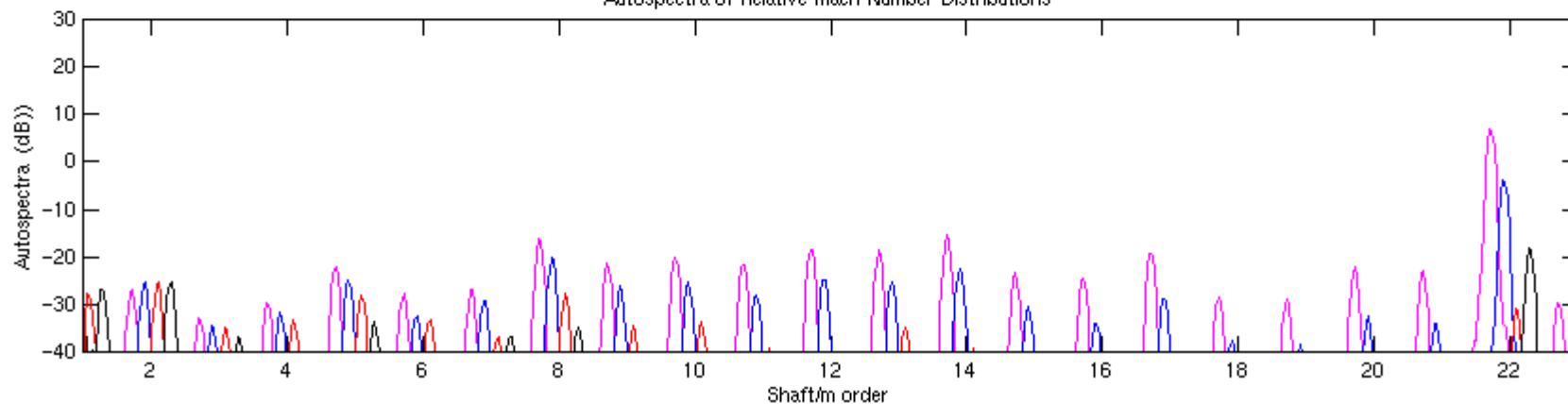


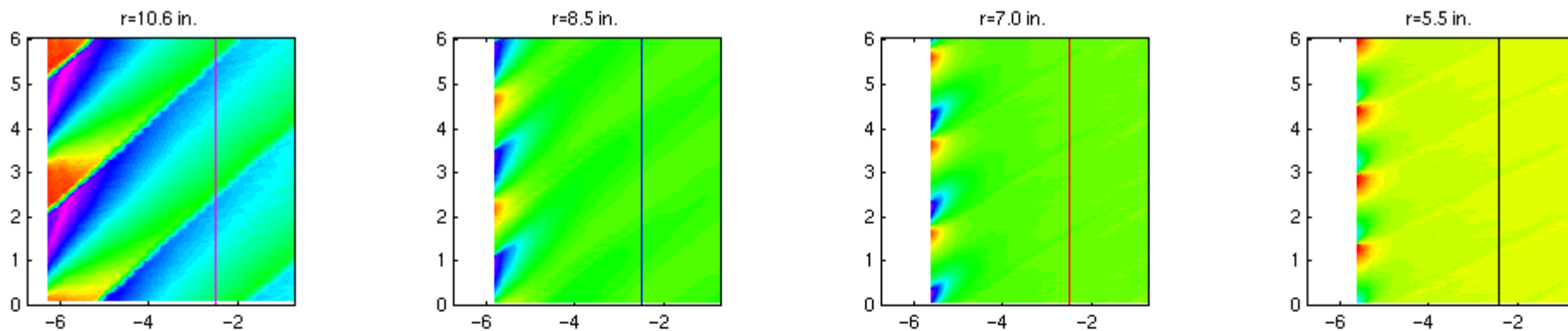
Relative Mach Number Distribution Across Rotor Rev



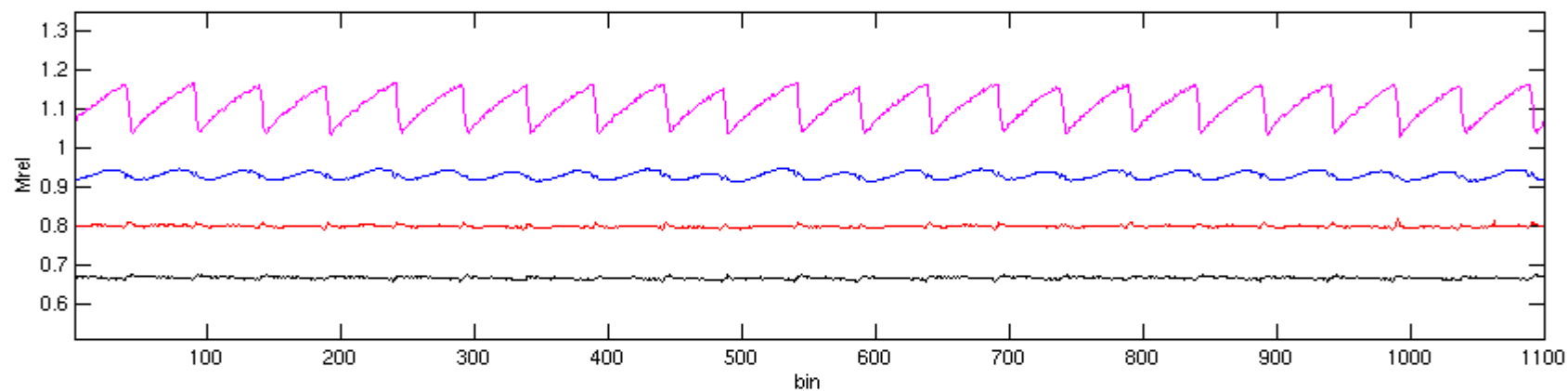
24

Autospectra of Relative Mach Number Distributions



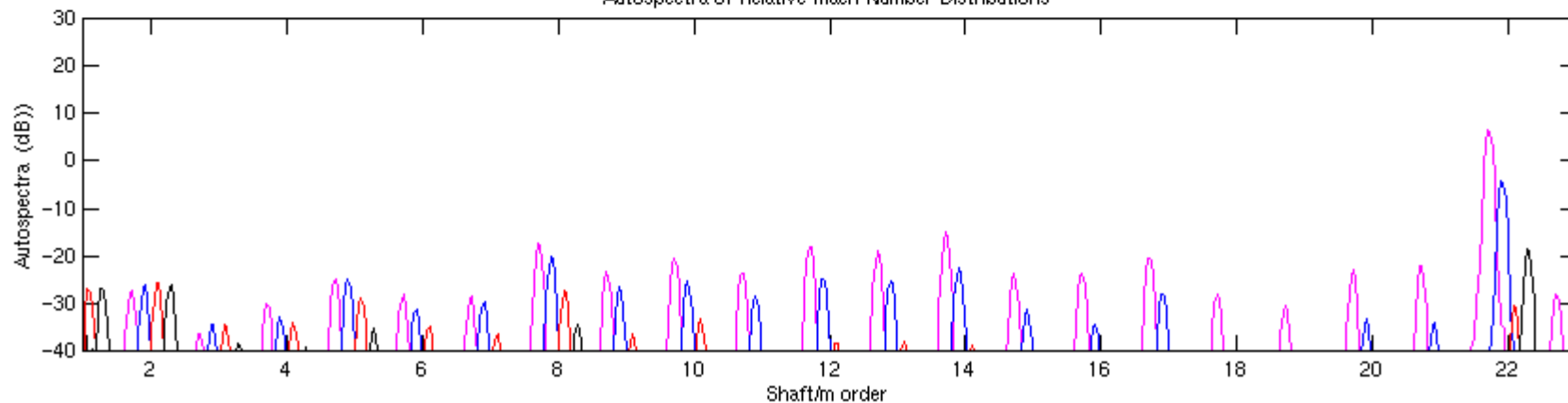


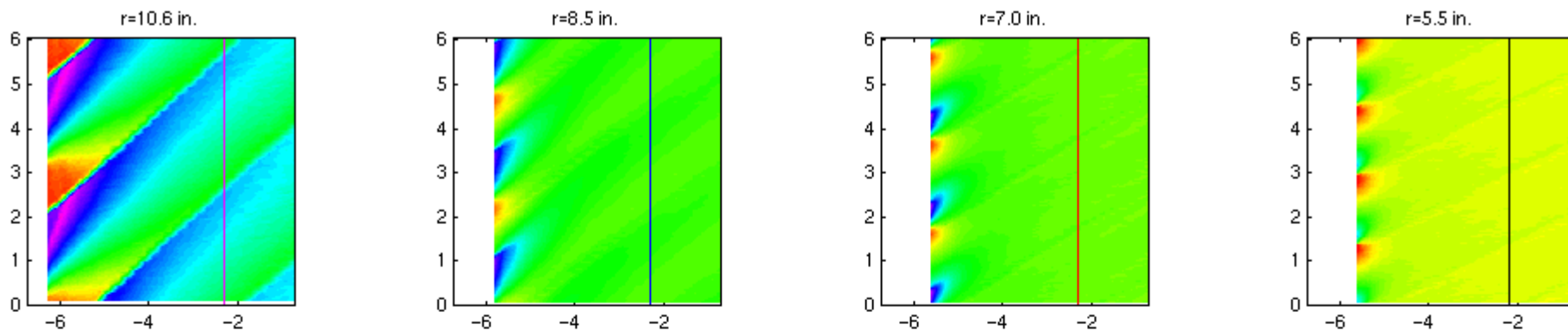
Relative Mach Number Distribution Across Rotor Rev



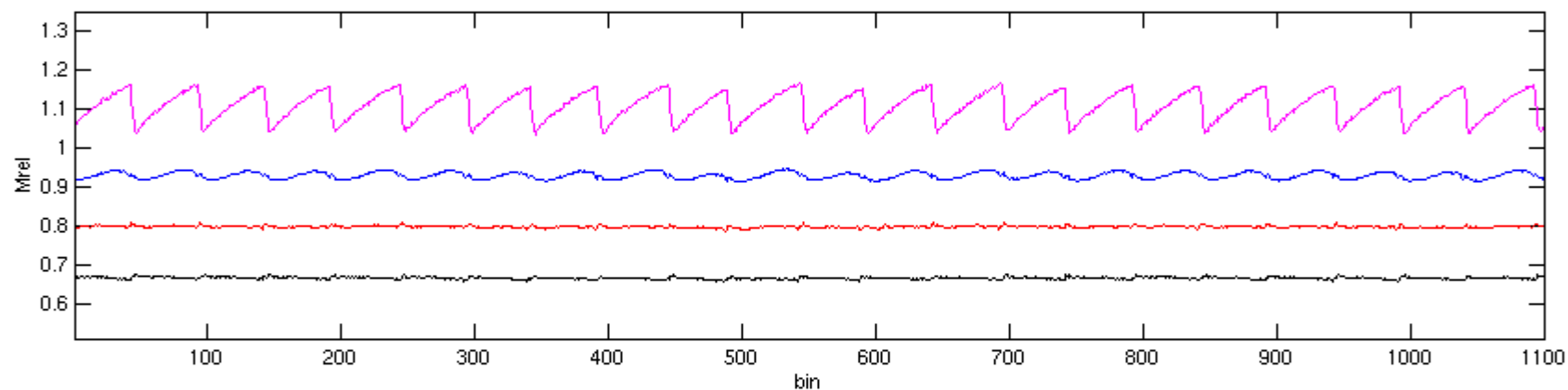
25

Autospectra of Relative Mach Number Distributions



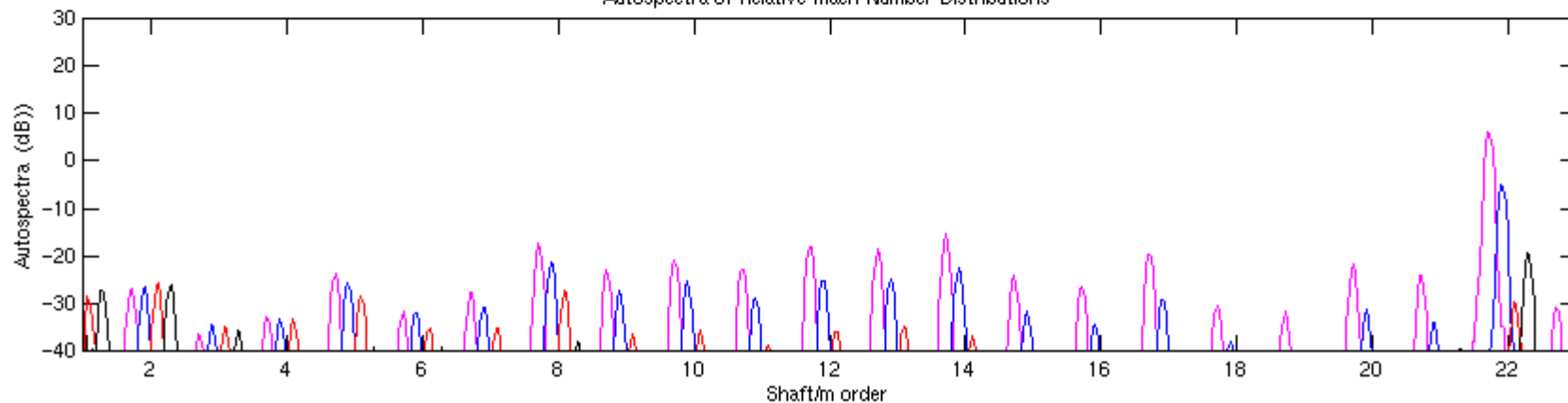


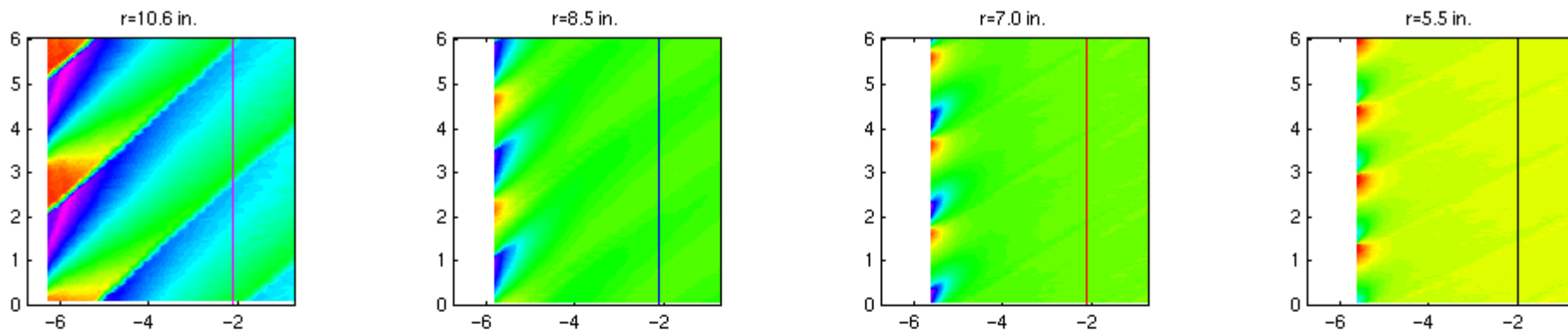
Relative Mach Number Distribution Across Rotor Rev



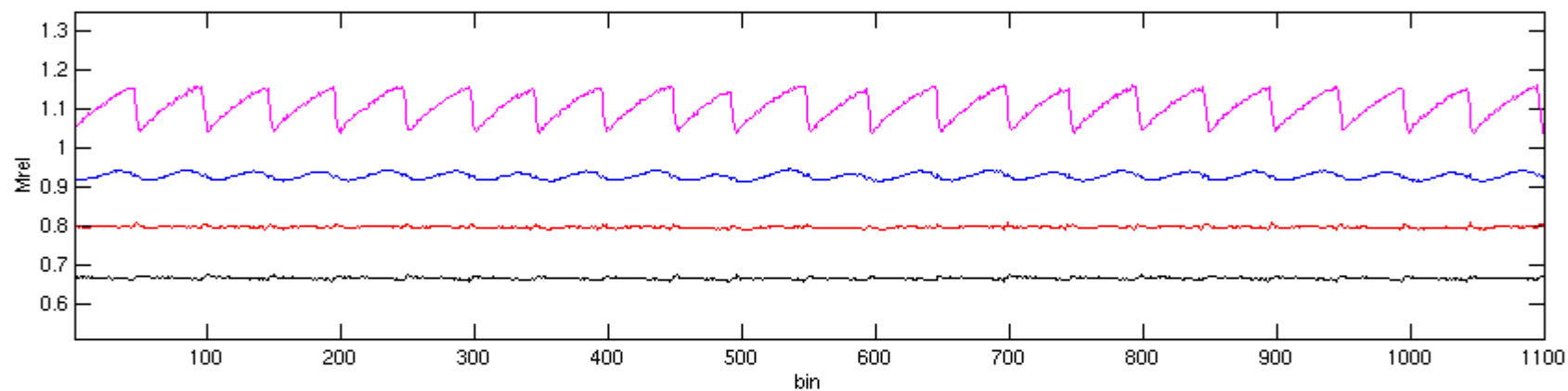
26

Autospectra of Relative Mach Number Distributions



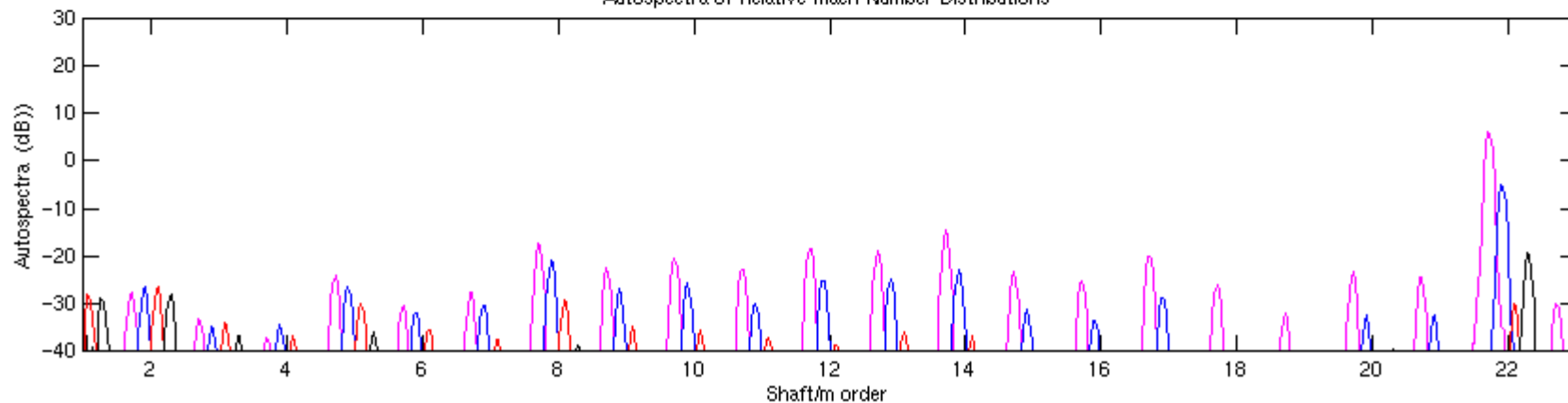


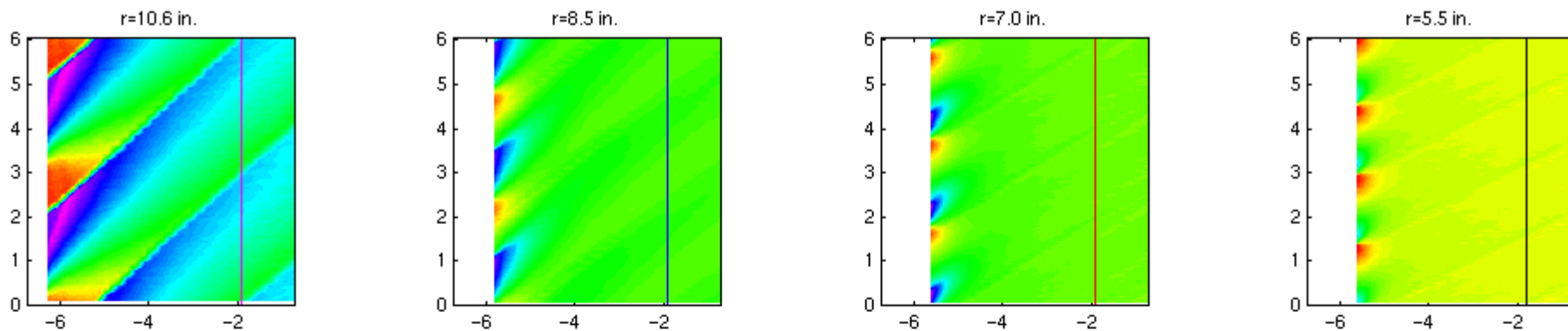
Relative Mach Number Distribution Across Rotor Rev



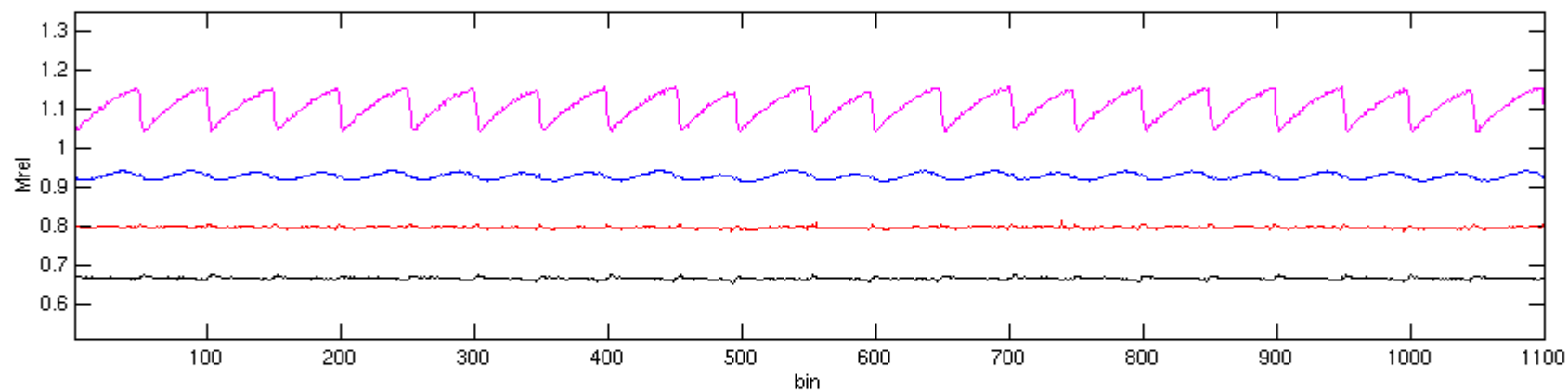
27

Autospectra of Relative Mach Number Distributions



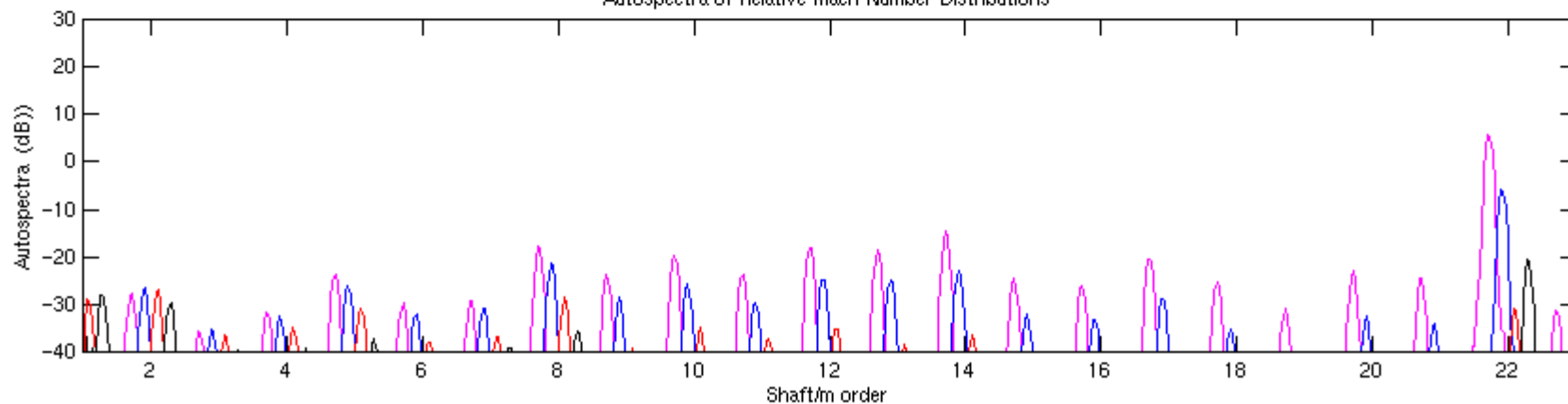


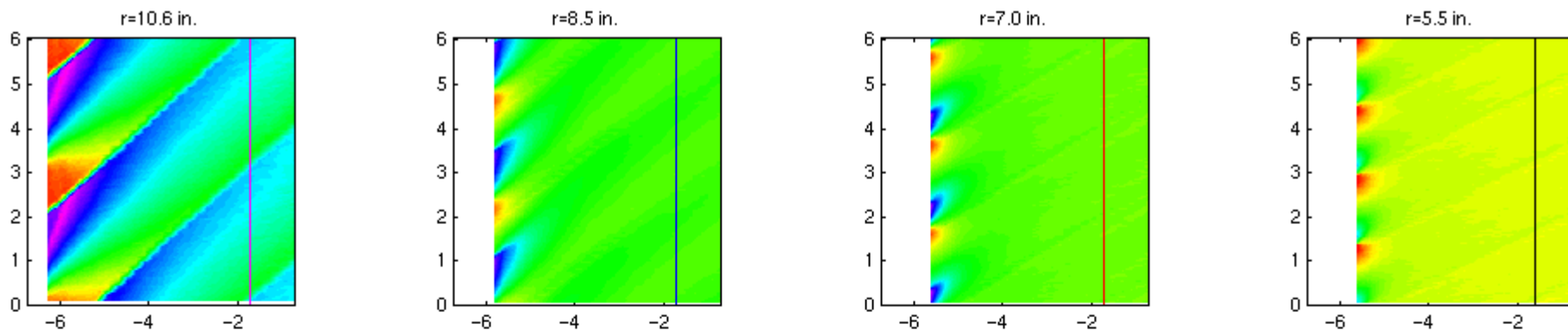
Relative Mach Number Distribution Across Rotor Rev



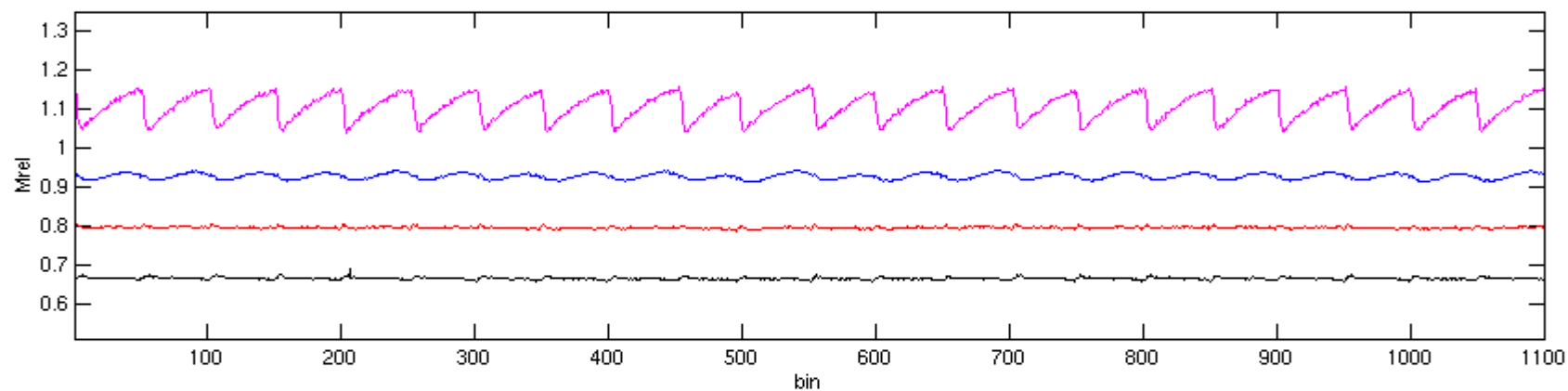
28

Autospectra of Relative Mach Number Distributions



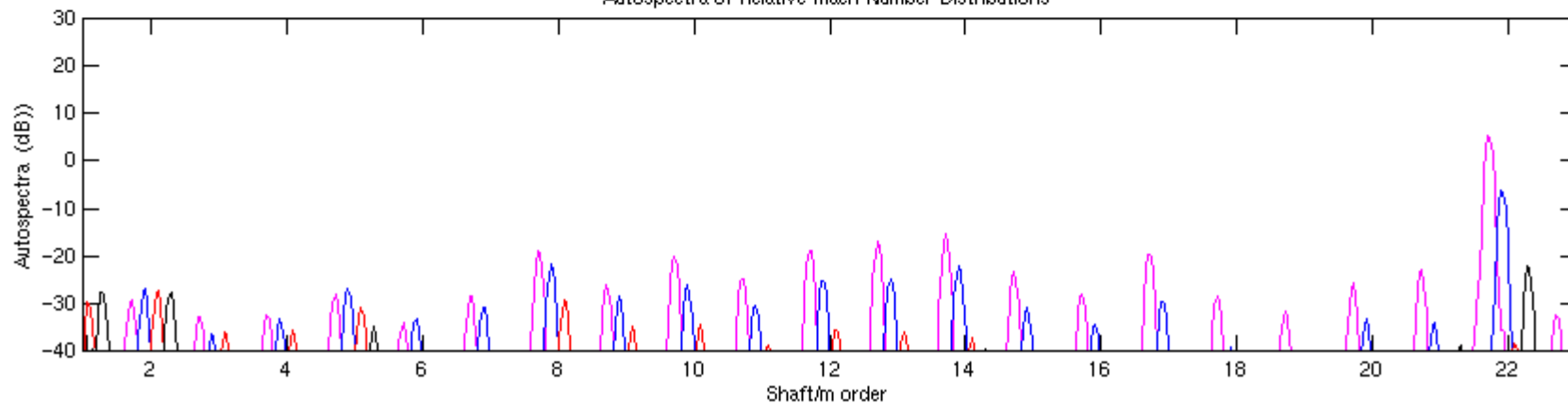


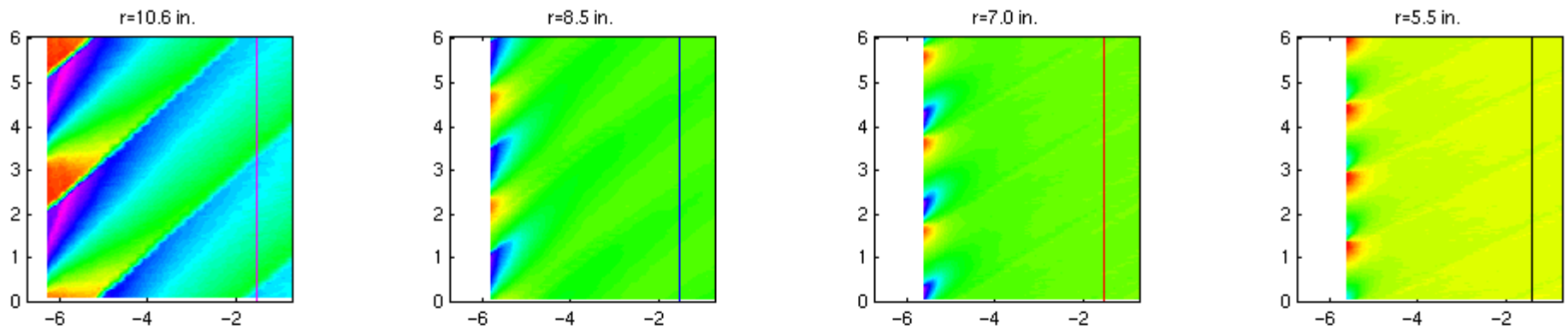
Relative Mach Number Distribution Across Rotor Rev



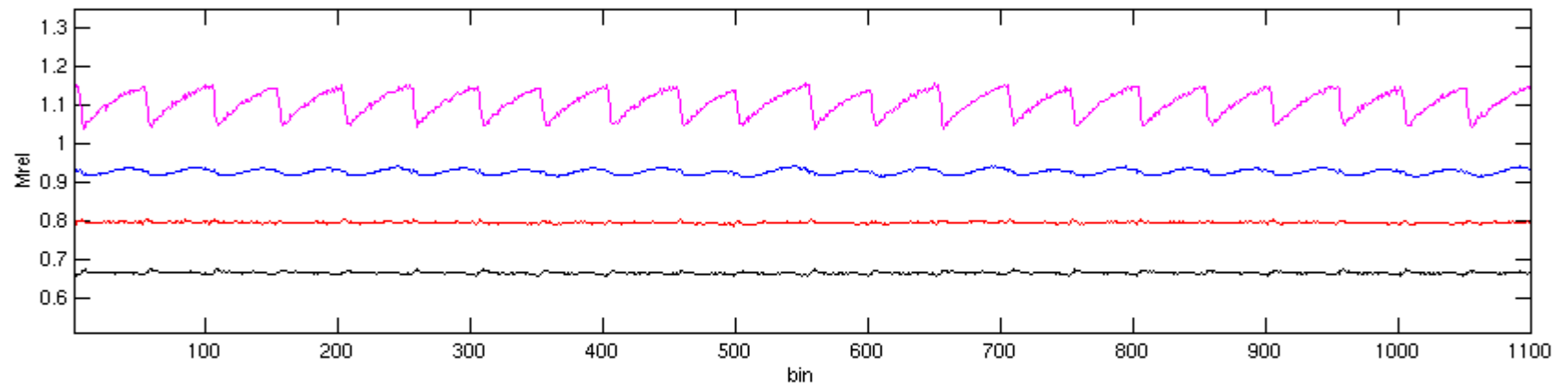
29

Autospectra of Relative Mach Number Distributions



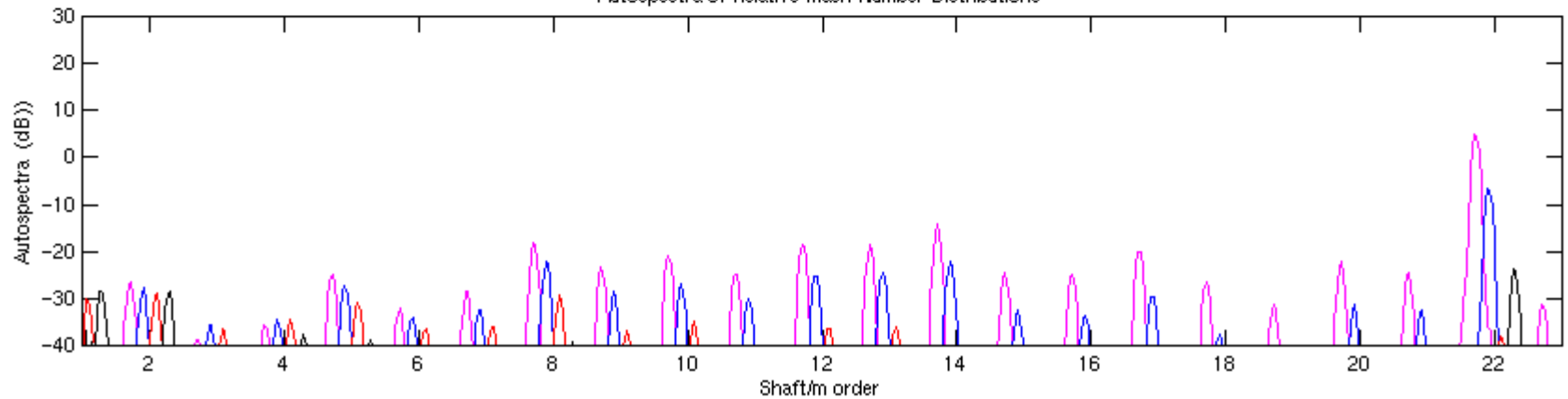


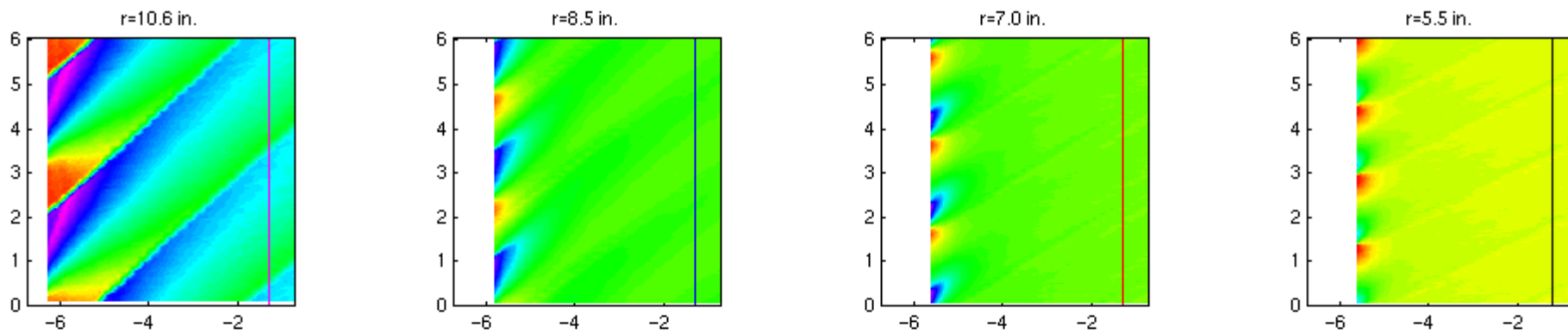
Relative Mach Number Distribution Across Rotor Rev



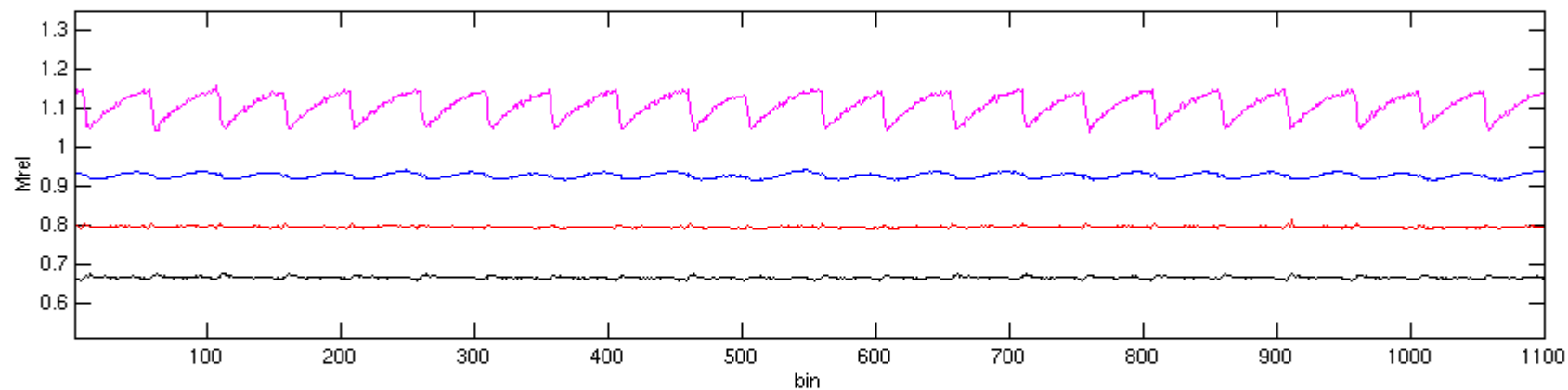
30

Autospectra of Relative Mach Number Distributions



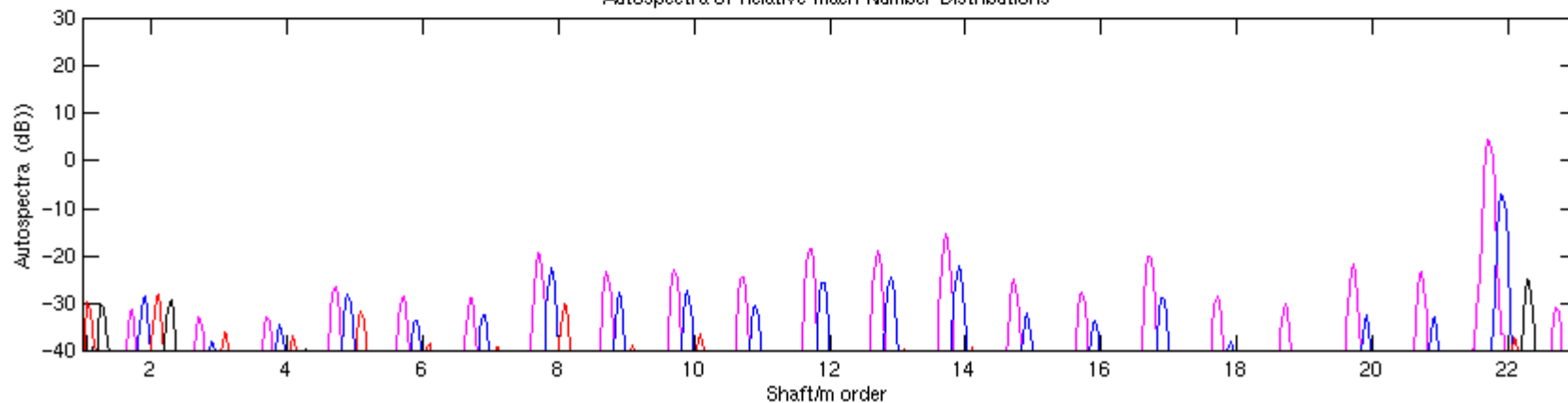


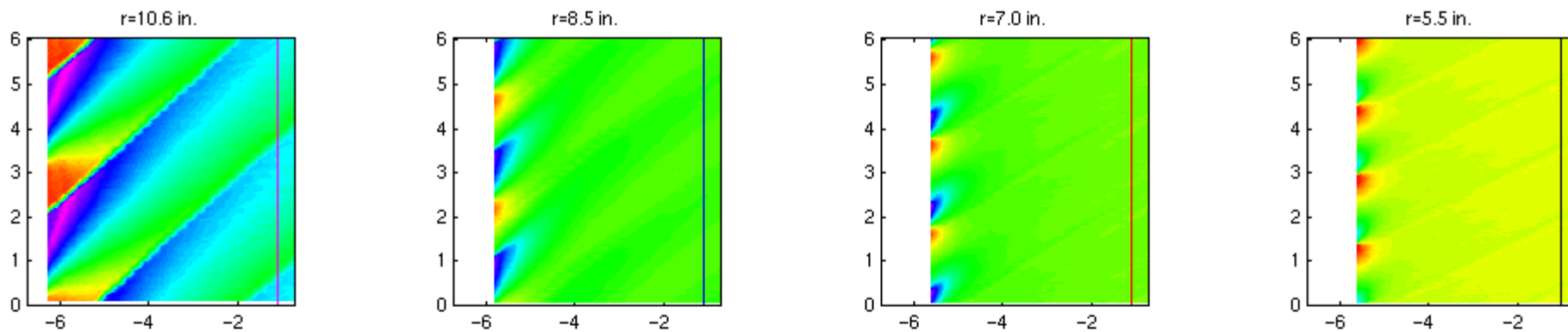
Relative Mach Number Distribution Across Rotor Rev



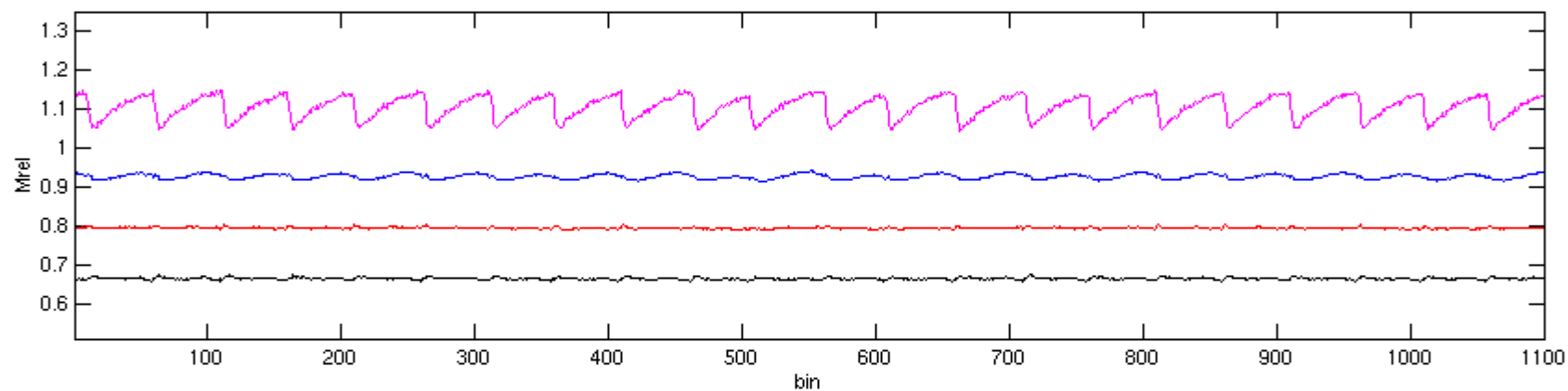
31

Autospectra of Relative Mach Number Distributions



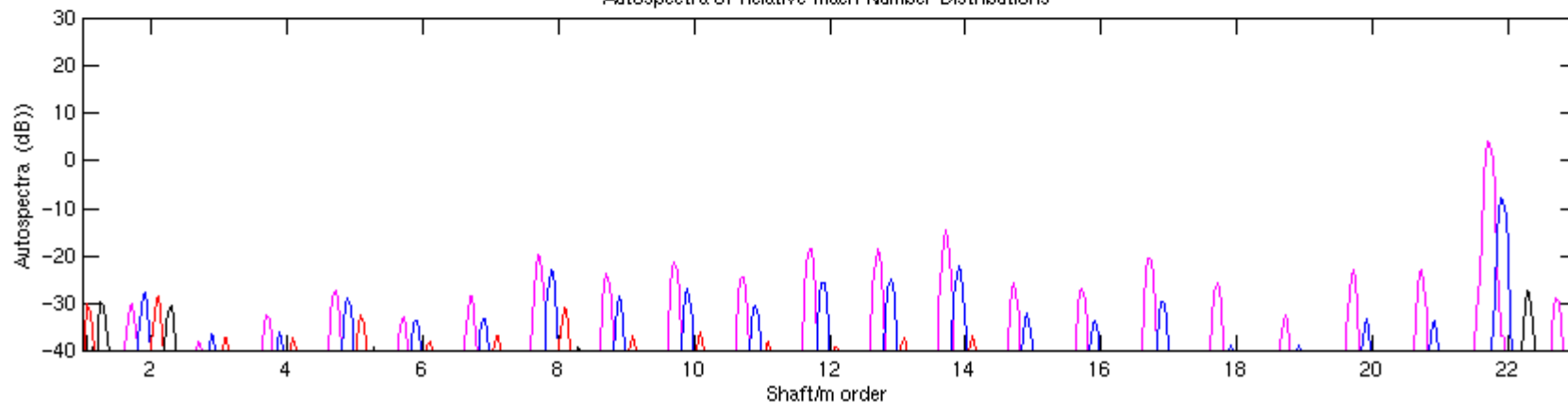


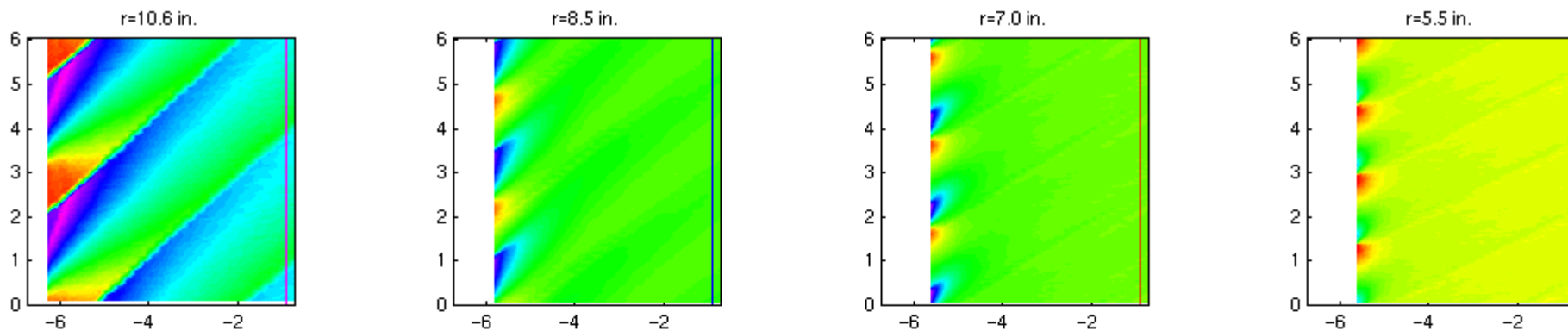
Relative Mach Number Distribution Across Rotor Rev



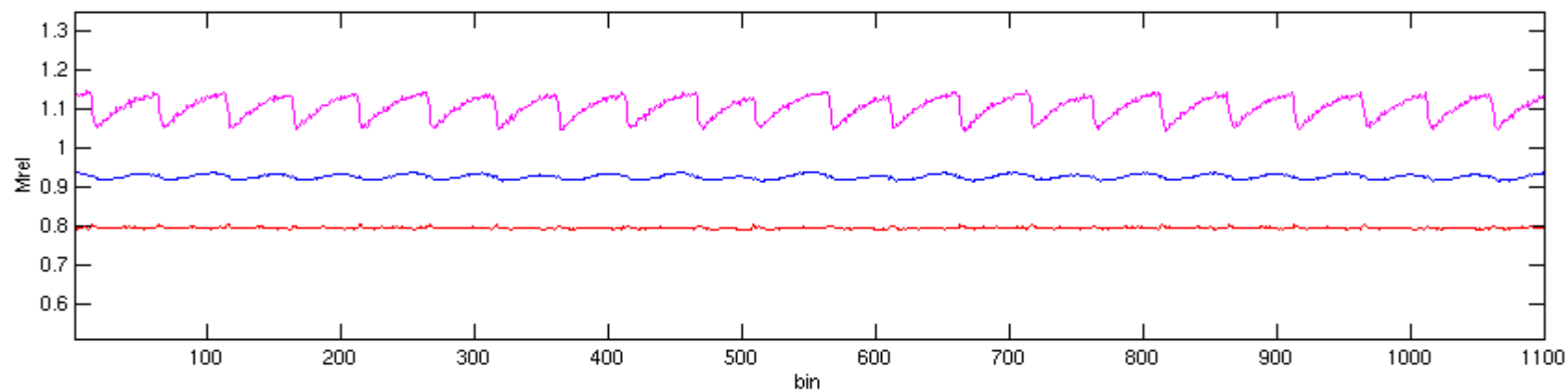
32

Autospectra of Relative Mach Number Distributions



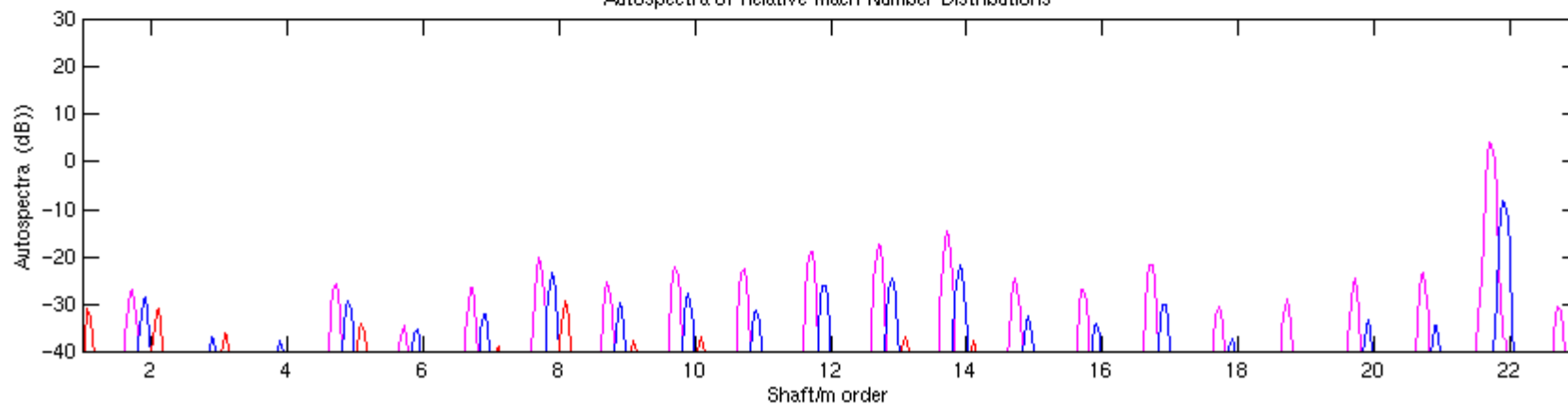


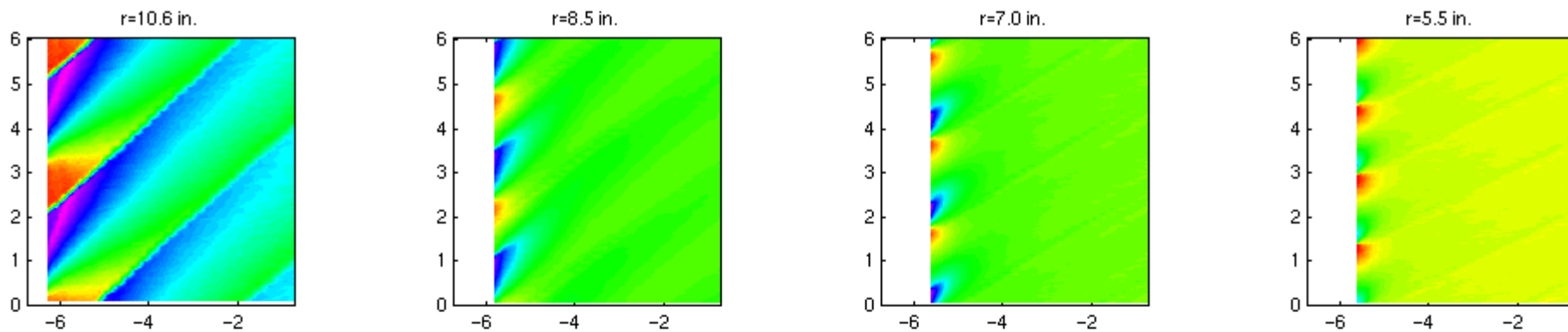
Relative Mach Number Distribution Across Rotor Rev



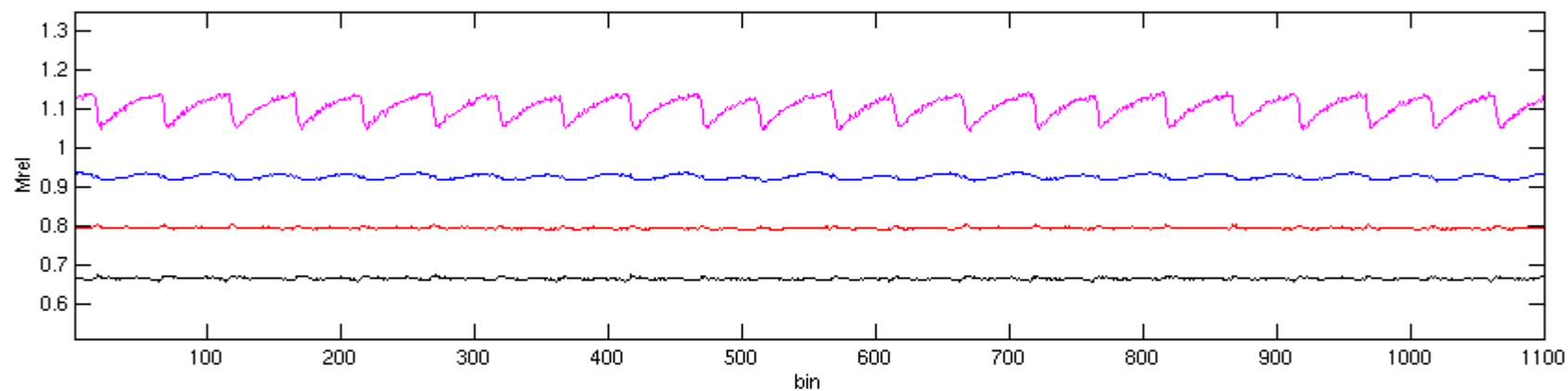
33

Autospectra of Relative Mach Number Distributions





Relative Mach Number Distribution Across Rotor Rev



34

Autospectra of Relative Mach Number Distributions

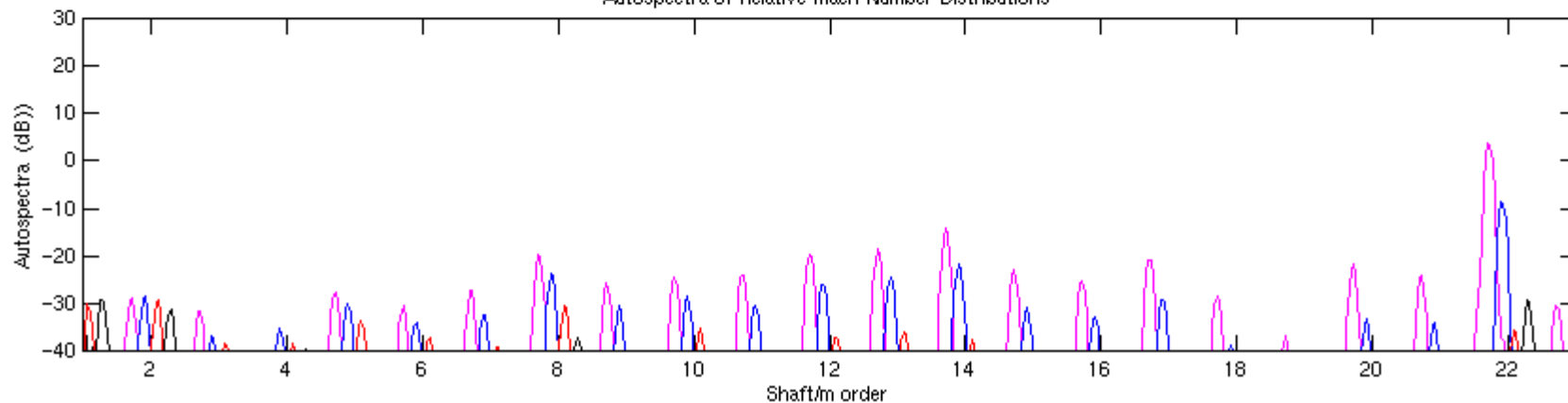


Figure 30.—Variation in the average amplitude of the disturbance measured upstream of the aft-swept fan with distance upstream of the leading edge.

Meas Loc. 1328 ft/s Tip Speed

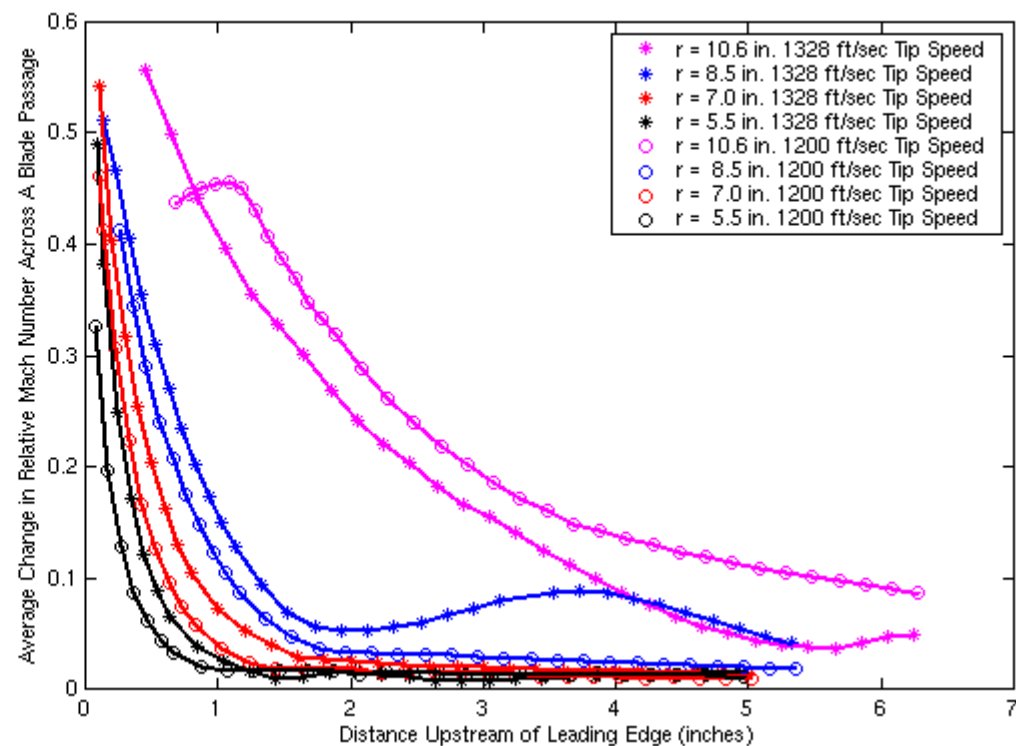
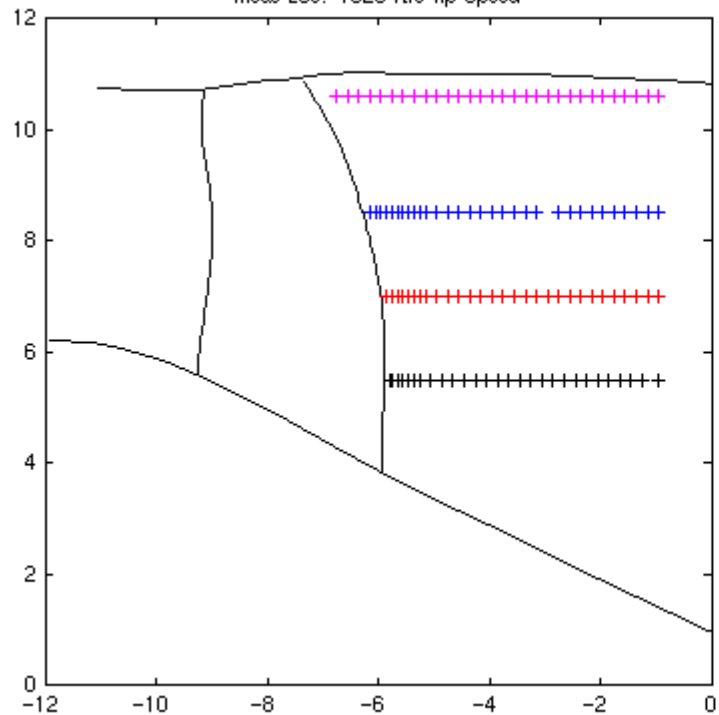


Figure 31.—Comparison of flows measured upstream of the aft-swept fan at $r = 10.6$ in. at the high-speed (top) and mid-speed (bottom) operating conditions.

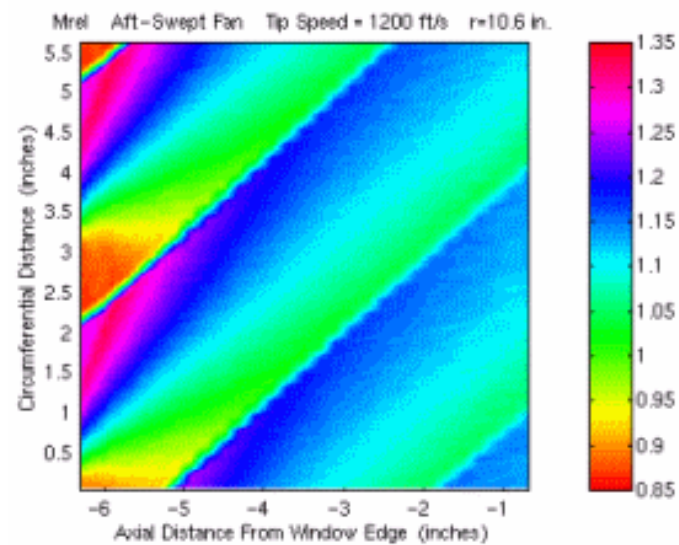
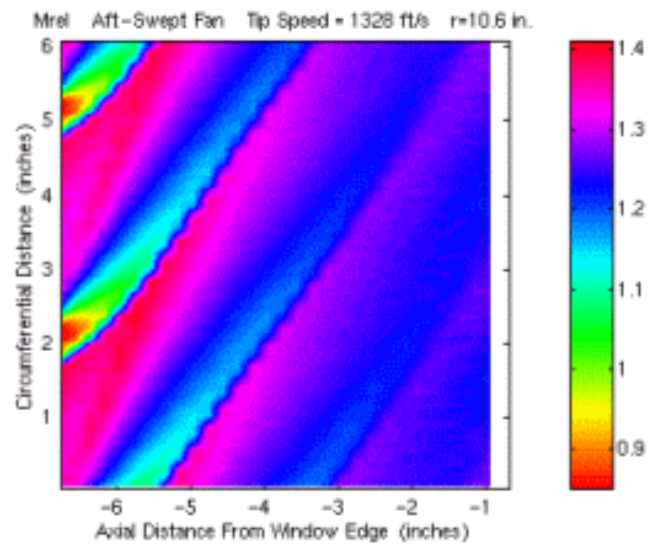
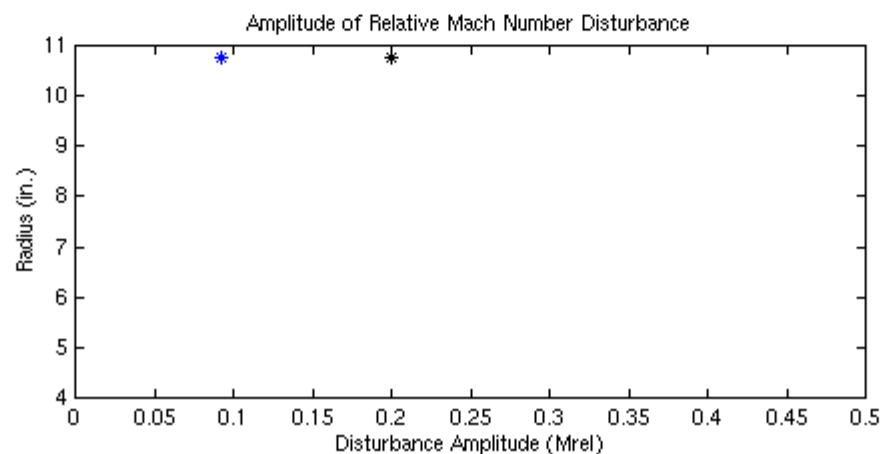
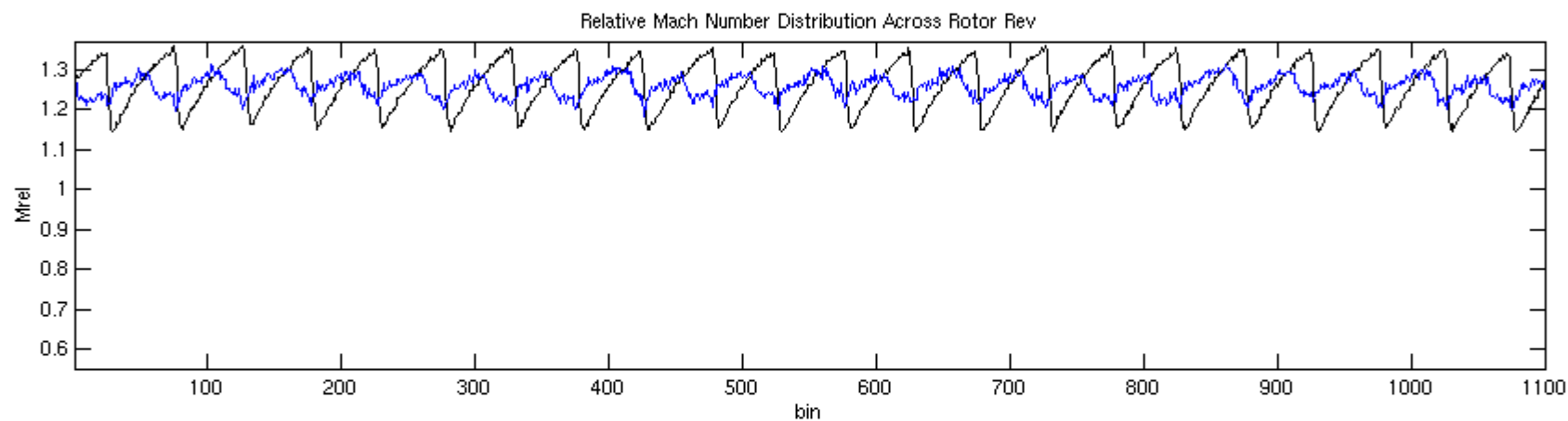
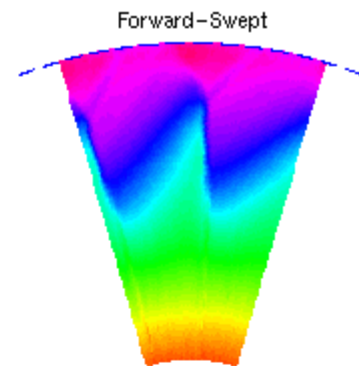
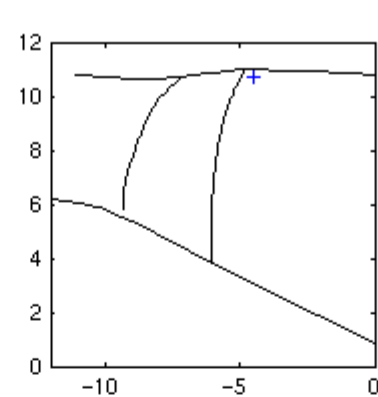
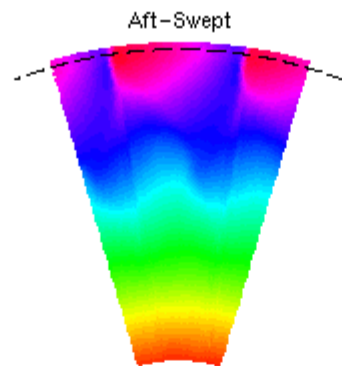
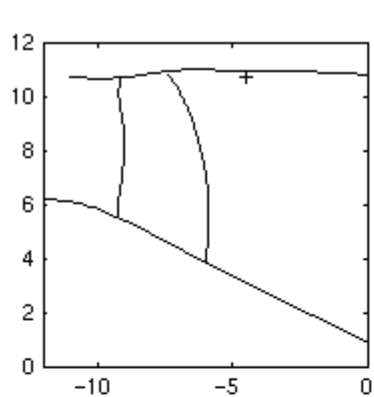
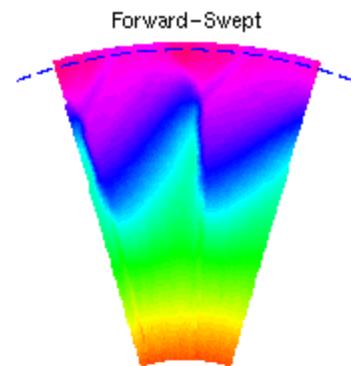
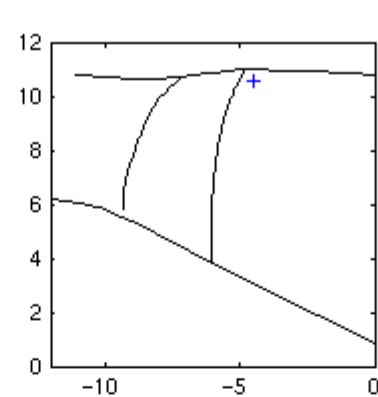
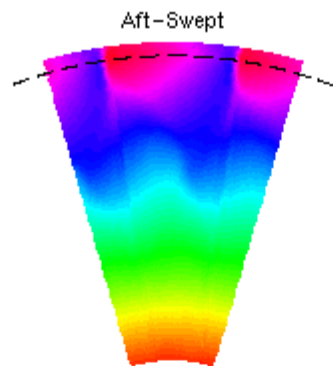
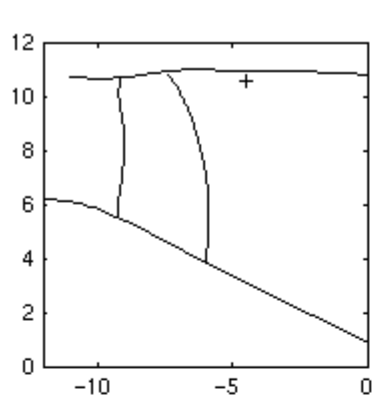
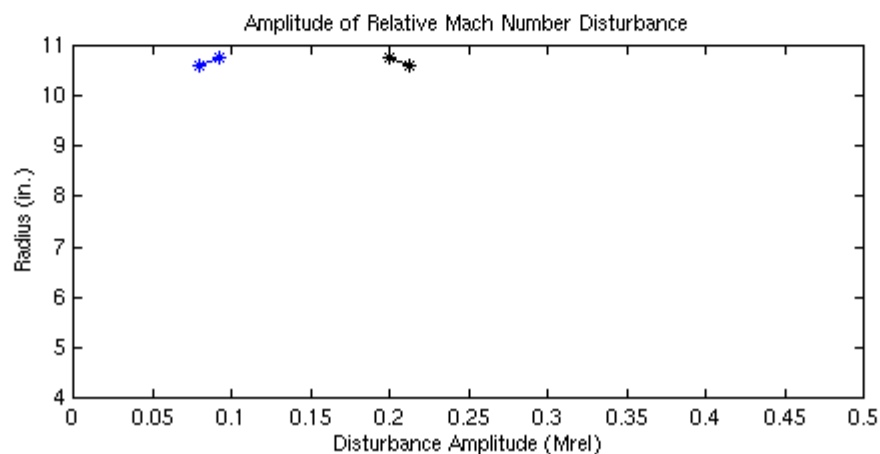
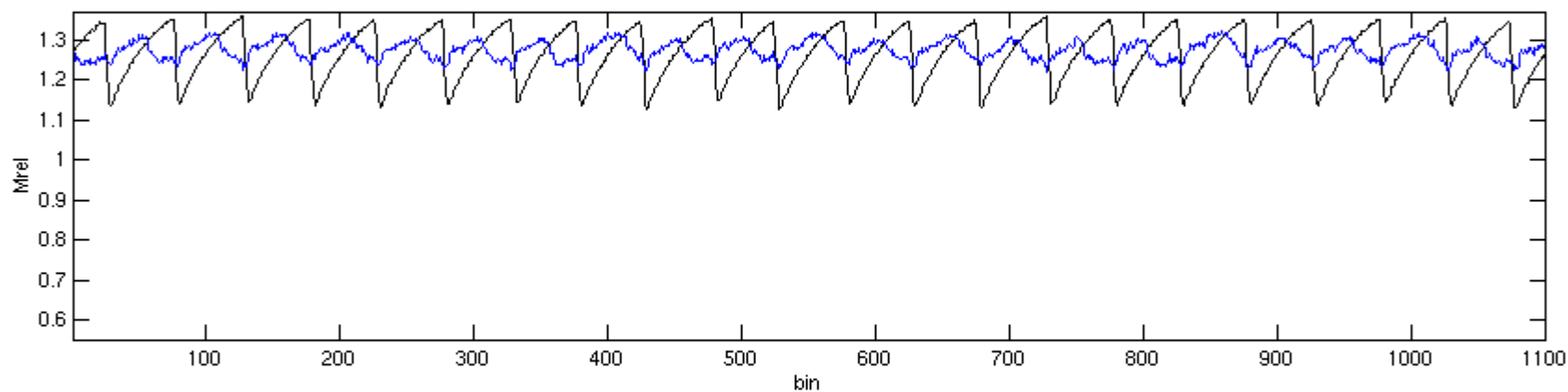


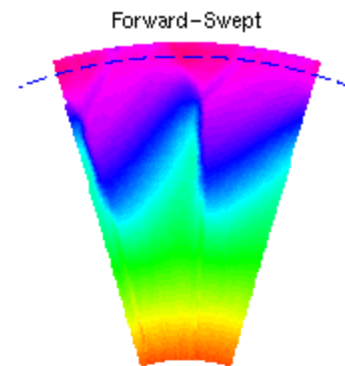
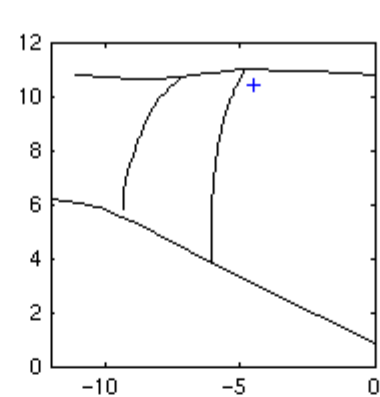
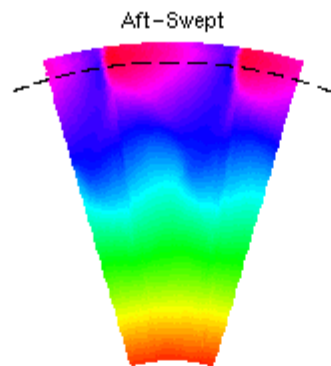
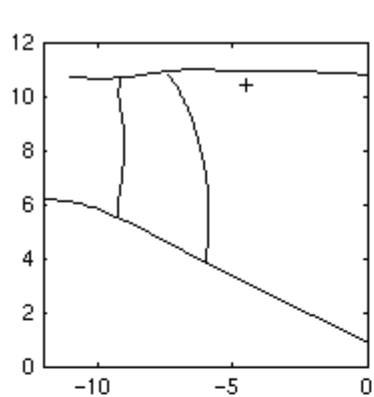
Figure 32.—Slideshow (36 slides) comparing the flows measured upstream of the aft-swept and forward-swept fans. The data were obtained at axial station 1 with the rotors operating at the high-speed condition. The line plots at the center of each slide show the relative Mach number distributions across all 22 blade passages. The plot at the bottom shows the average amplitude of the relative Mach number distributions (plotted along the x-axis) vs. radial location (plotted along the y-axis.) The dashed lines overlaid on top of the color contour plots show the axial locations at which the data presented on that slide were acquired.



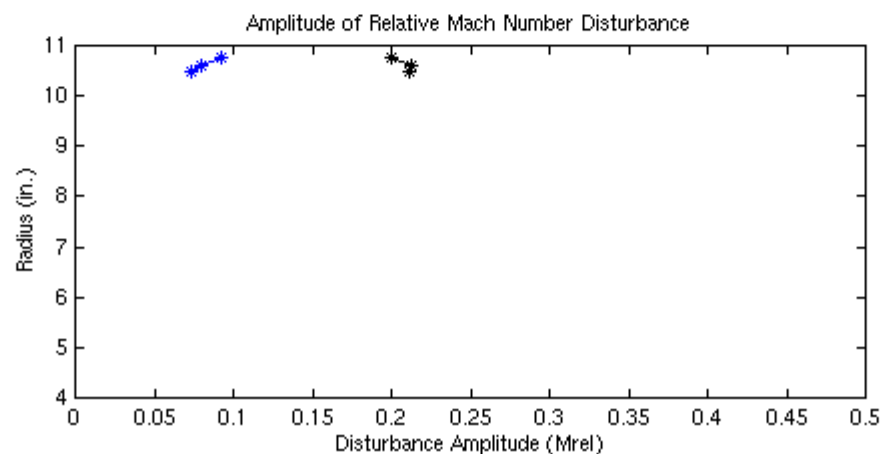
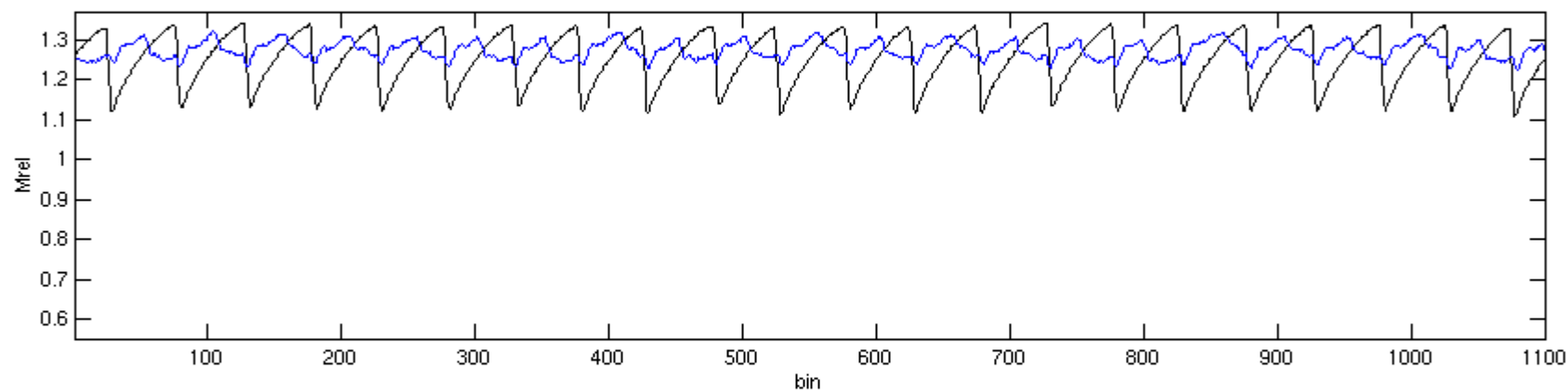


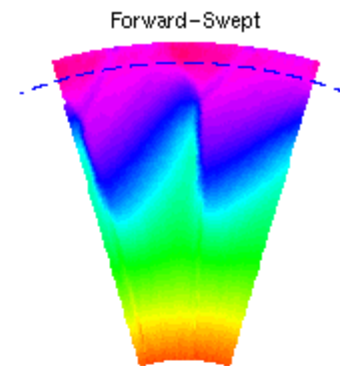
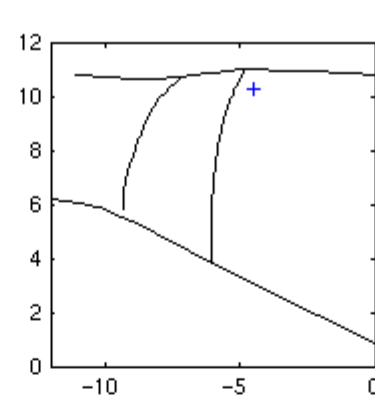
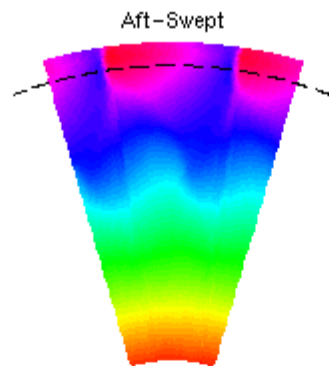
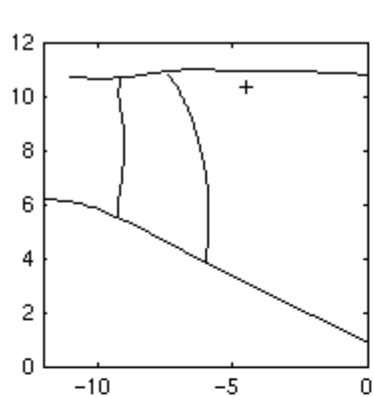
Relative Mach Number Distribution Across Rotor Rev



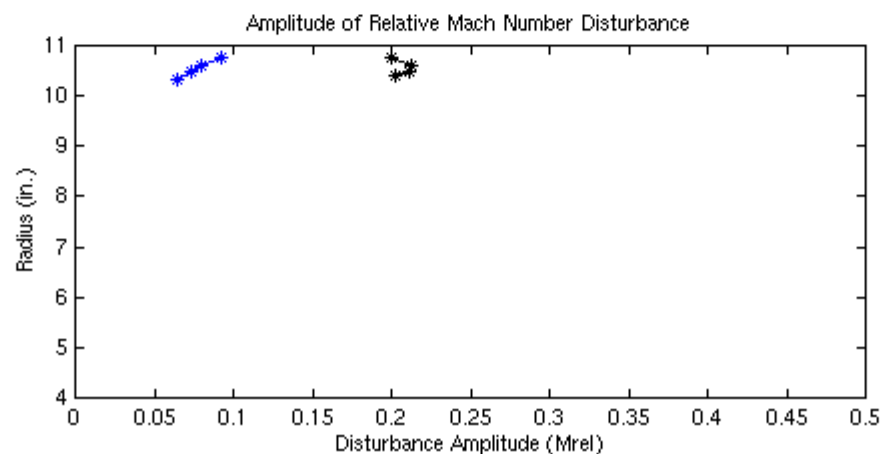
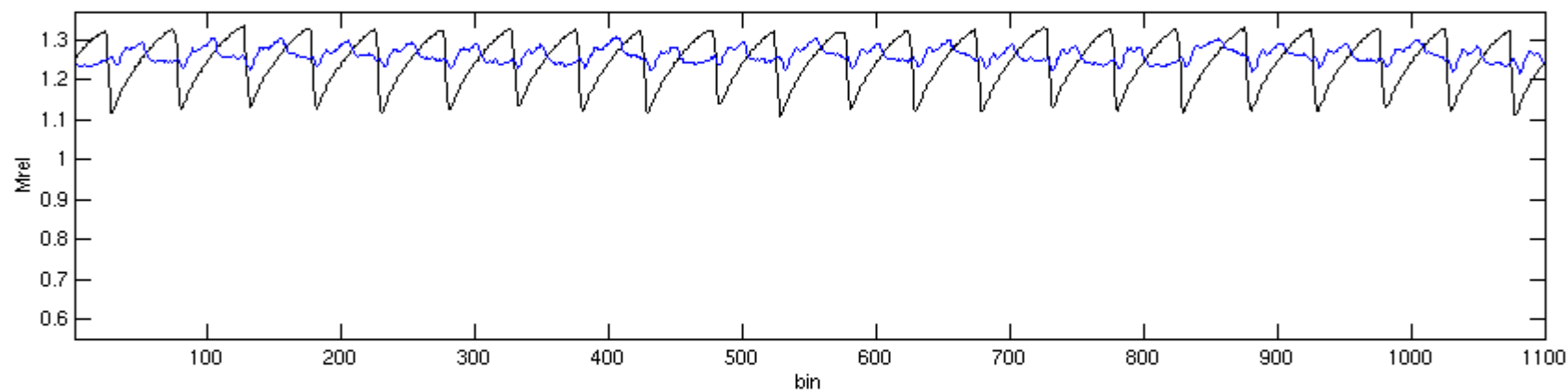


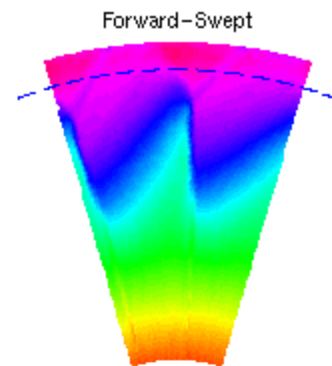
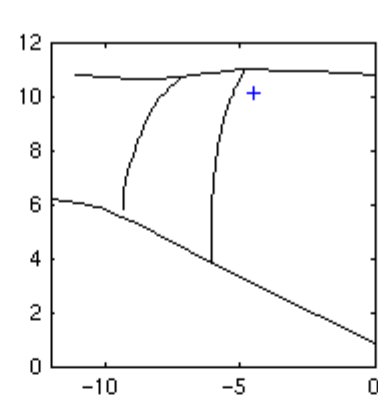
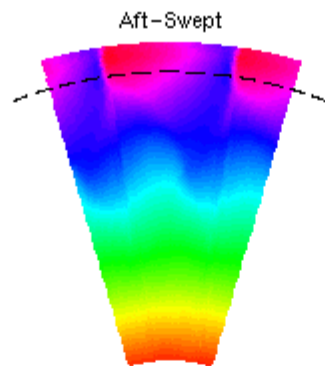
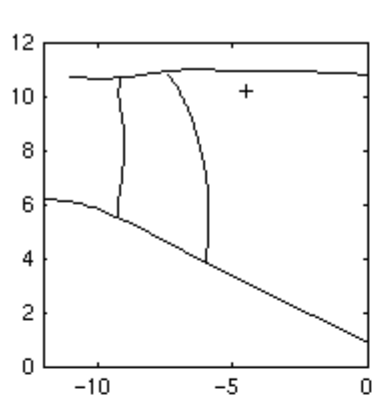
Relative Mach Number Distribution Across Rotor Rev



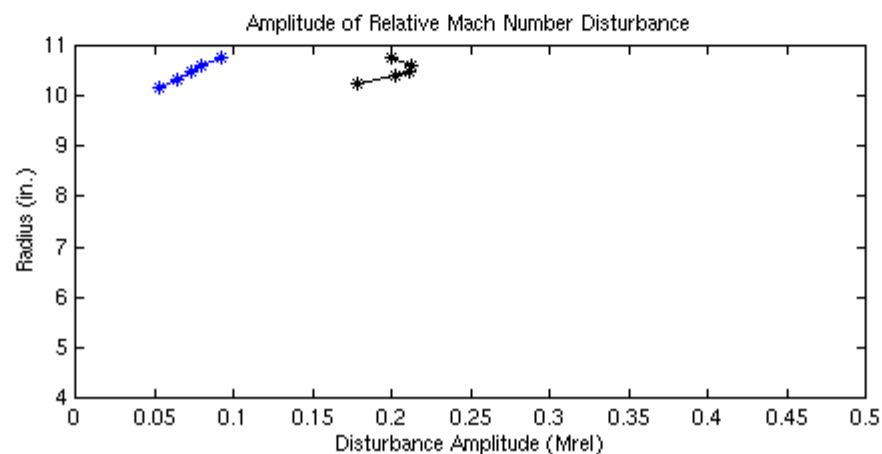
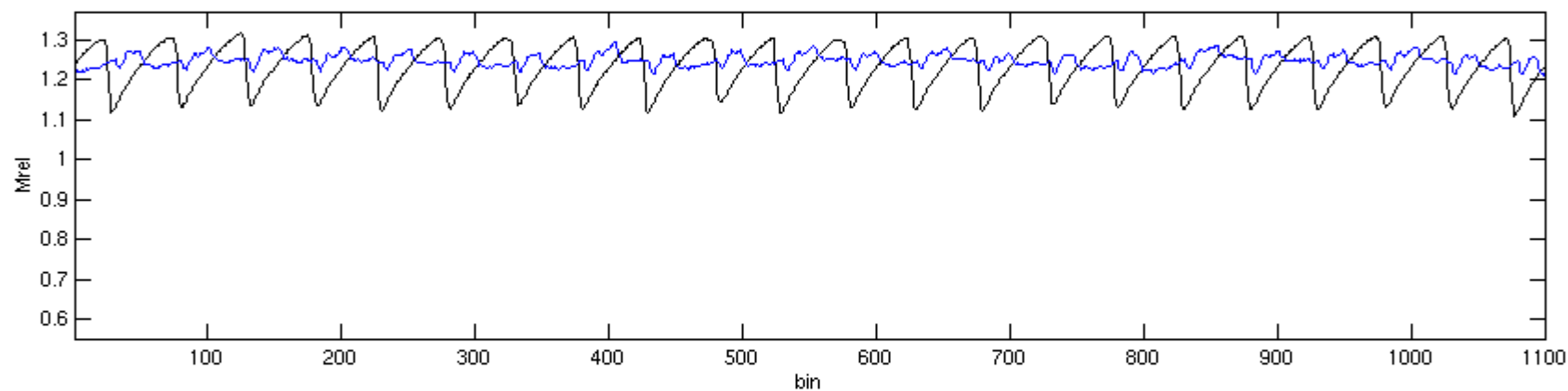


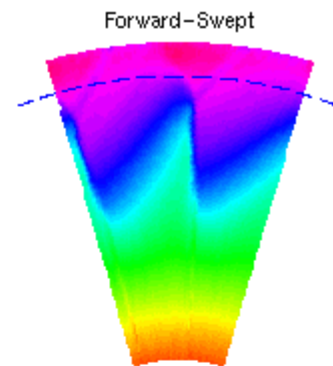
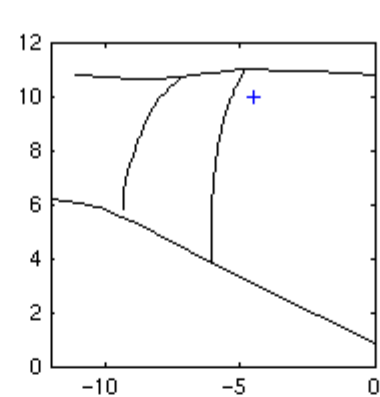
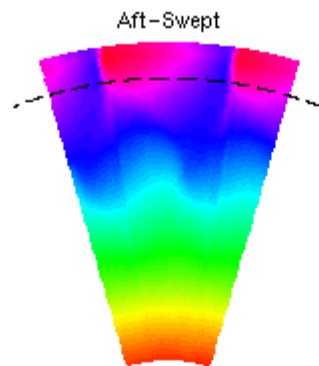
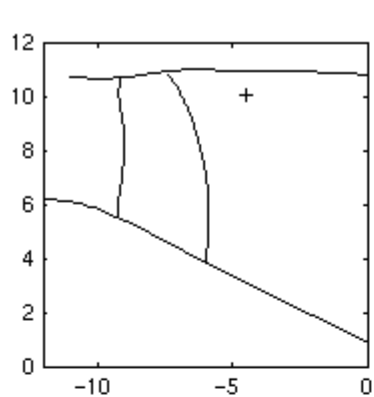
Relative Mach Number Distribution Across Rotor Rev



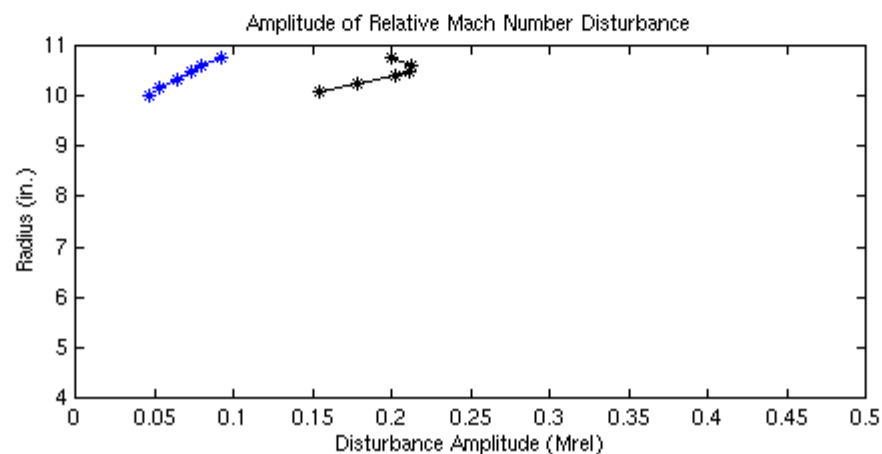
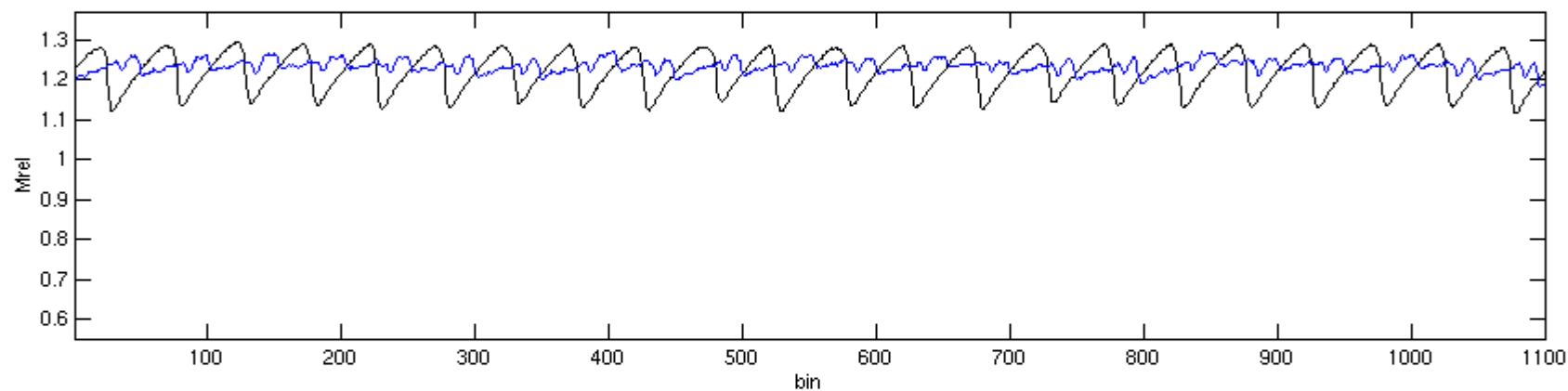


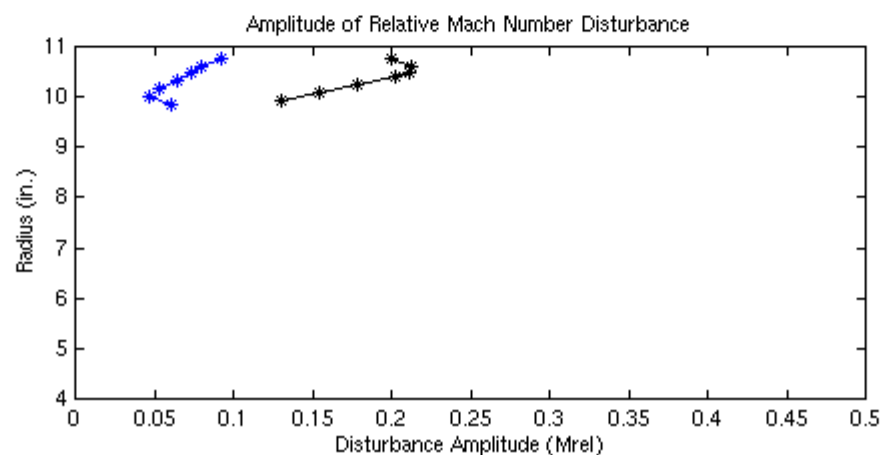
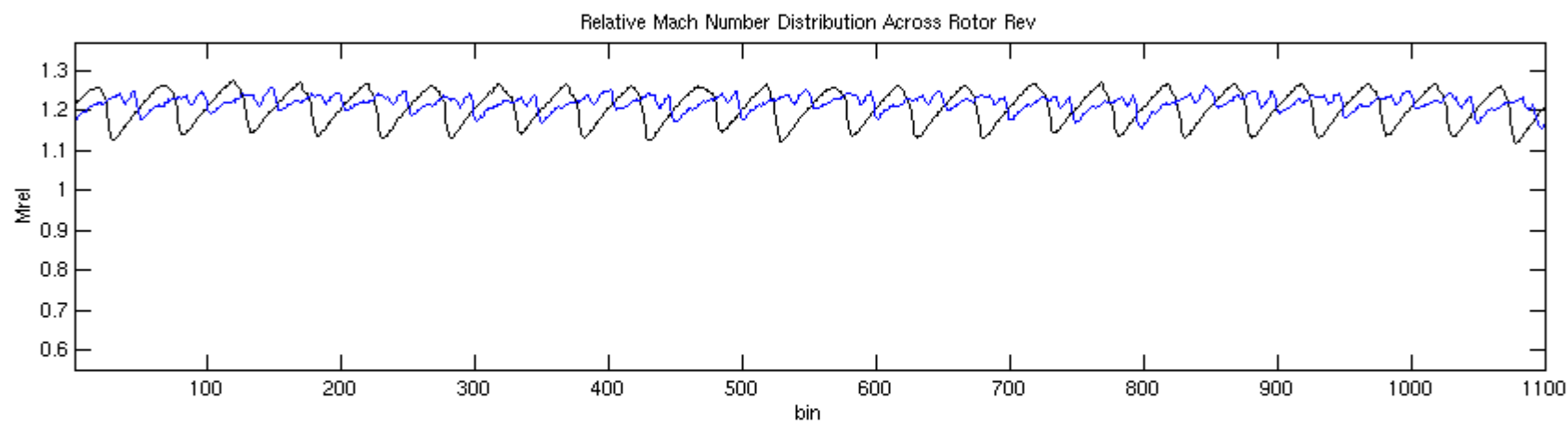
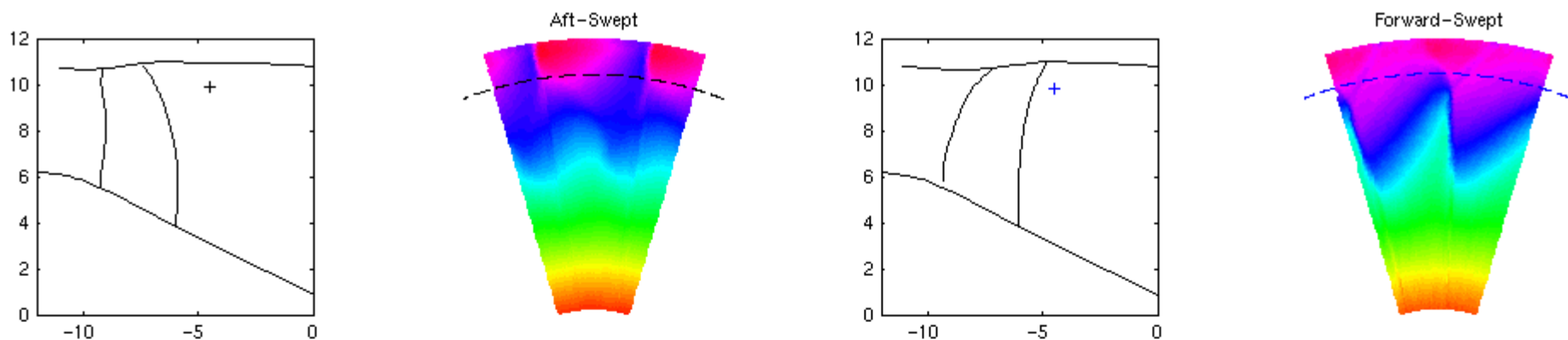
Relative Mach Number Distribution Across Rotor Rev

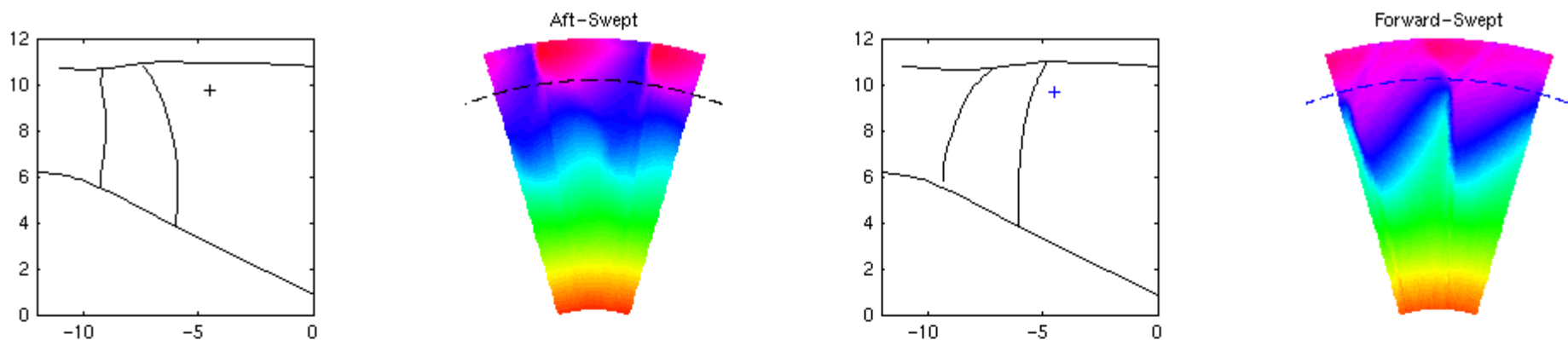




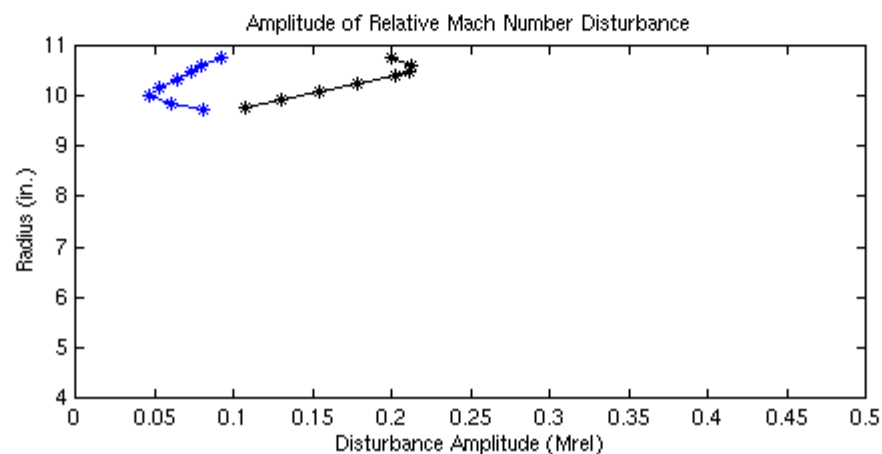
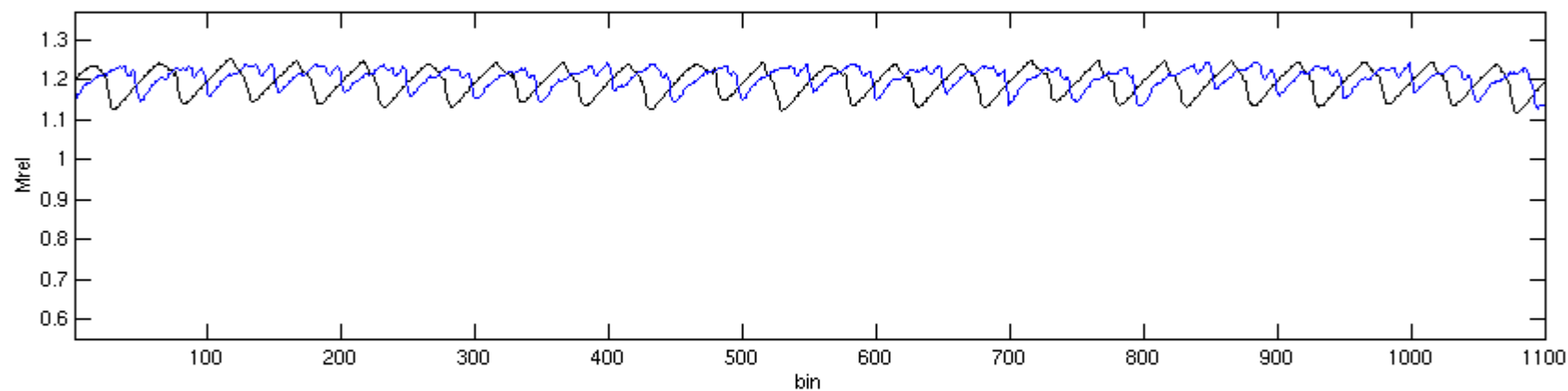
Relative Mach Number Distribution Across Rotor Rev

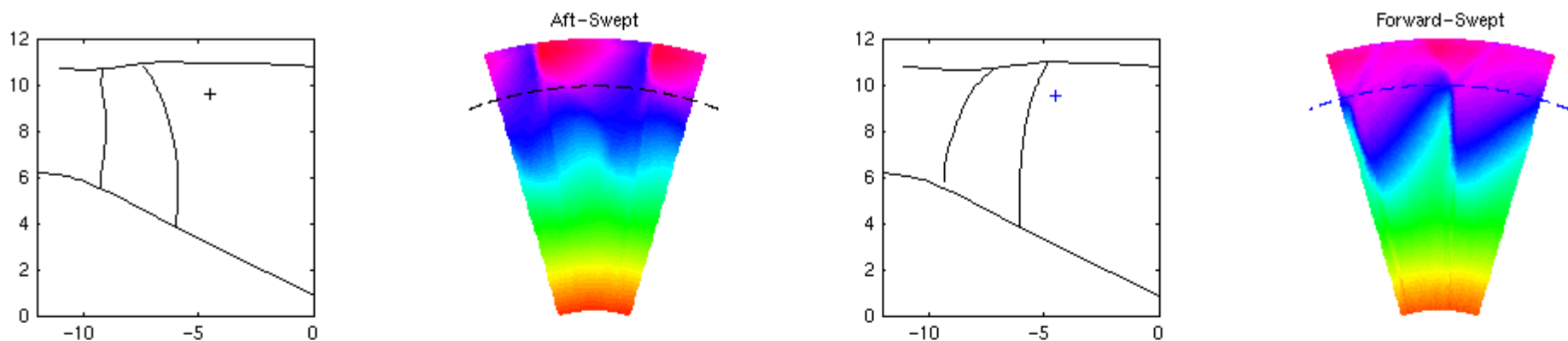




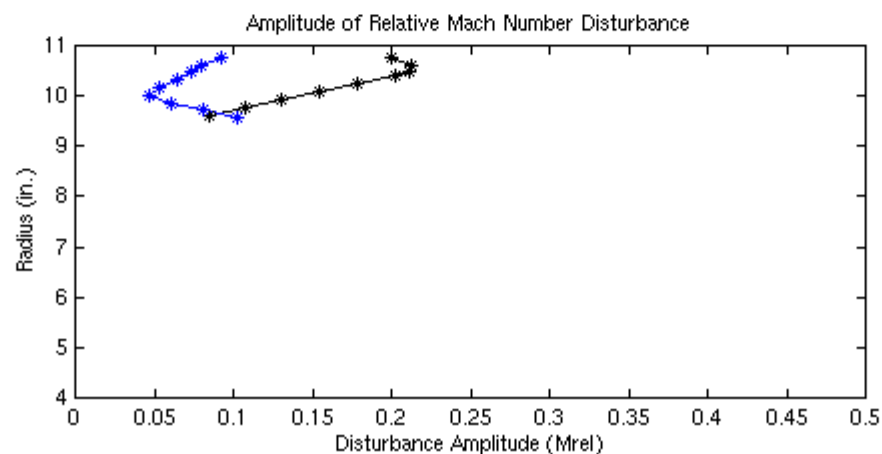
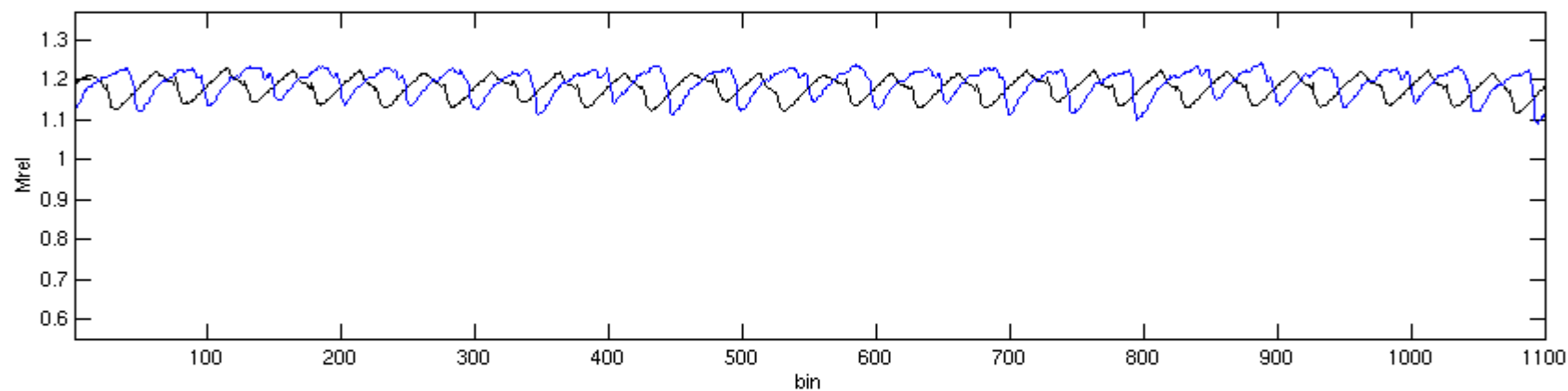


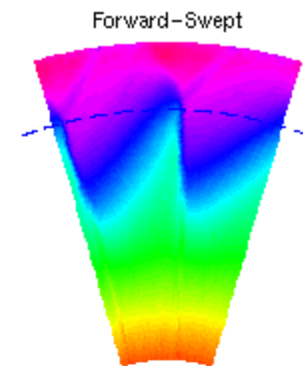
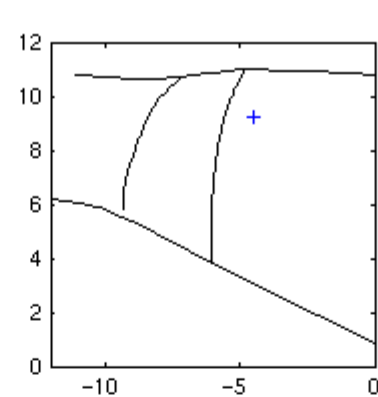
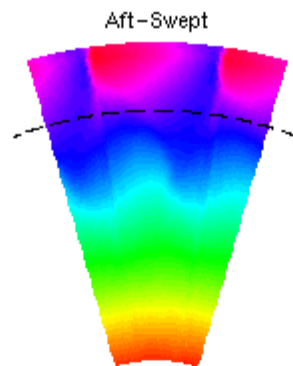
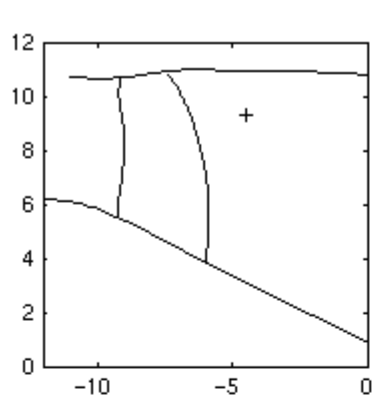
Relative Mach Number Distribution Across Rotor Rev



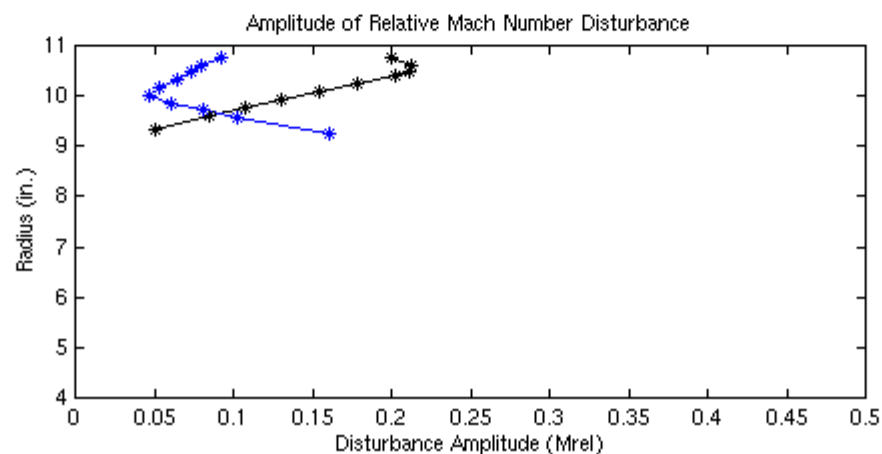
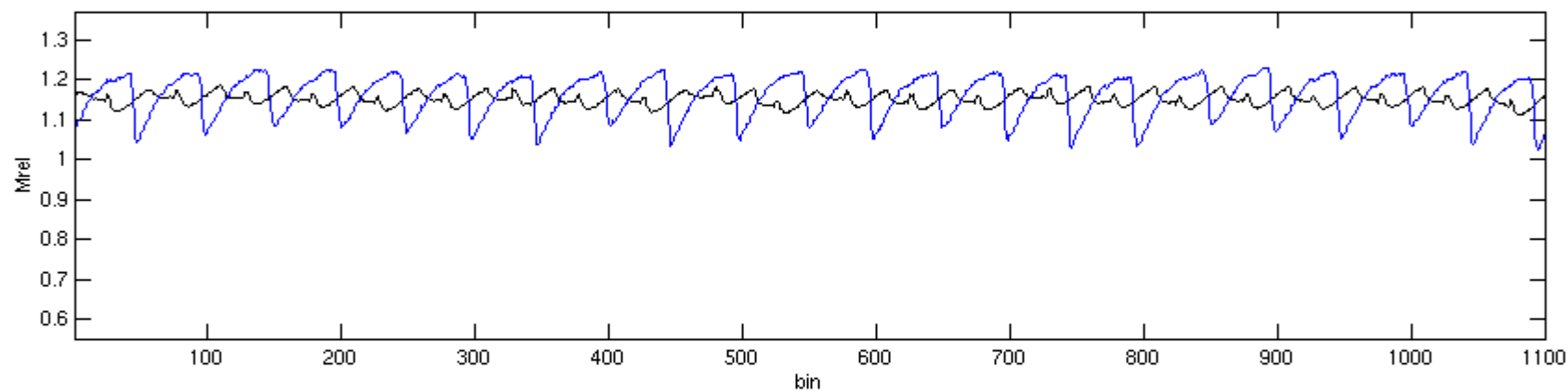


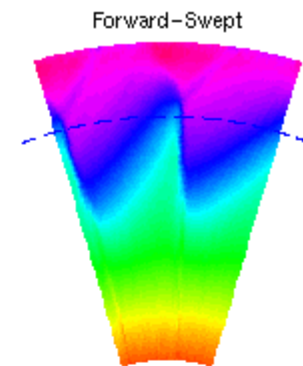
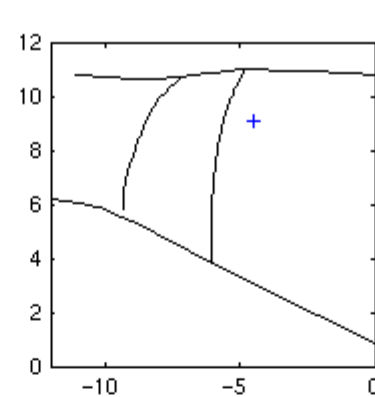
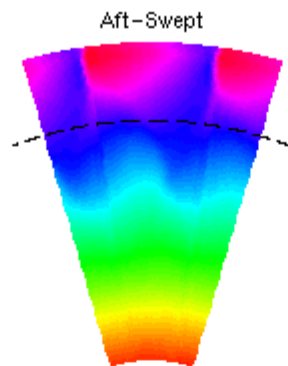
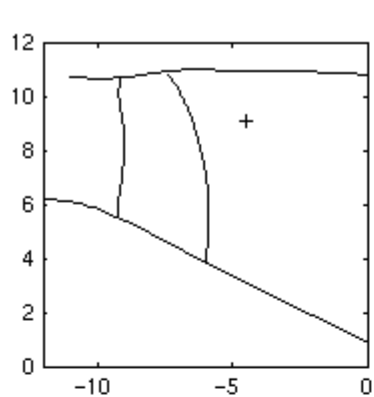
Relative Mach Number Distribution Across Rotor Rev



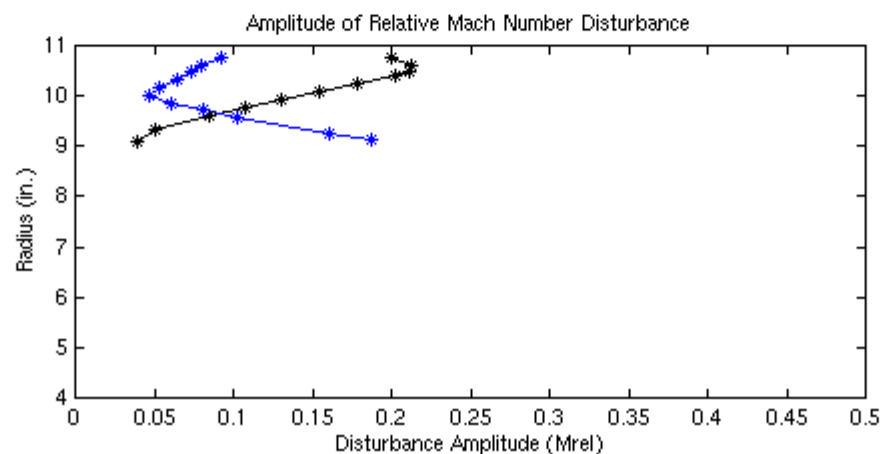
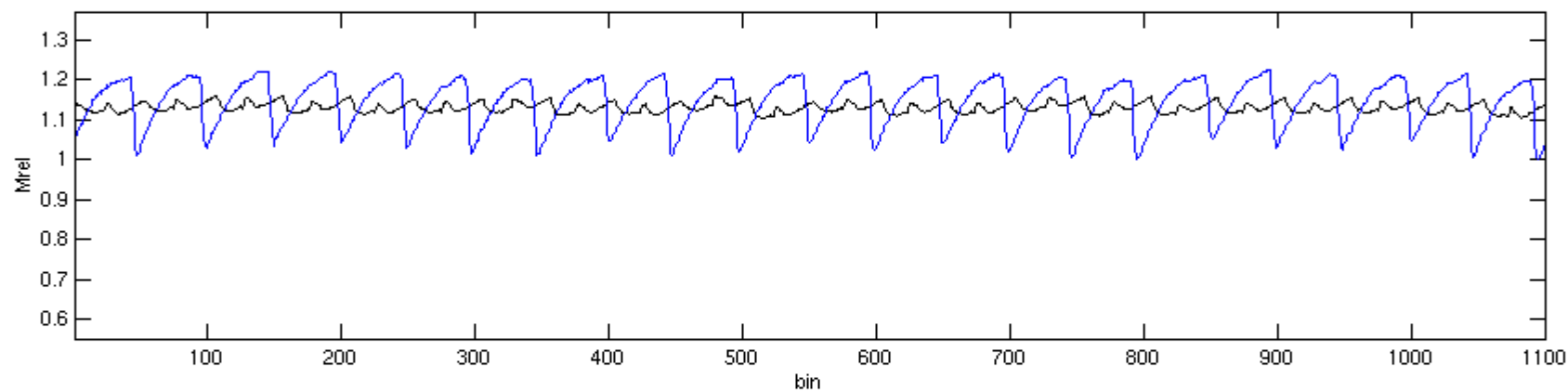


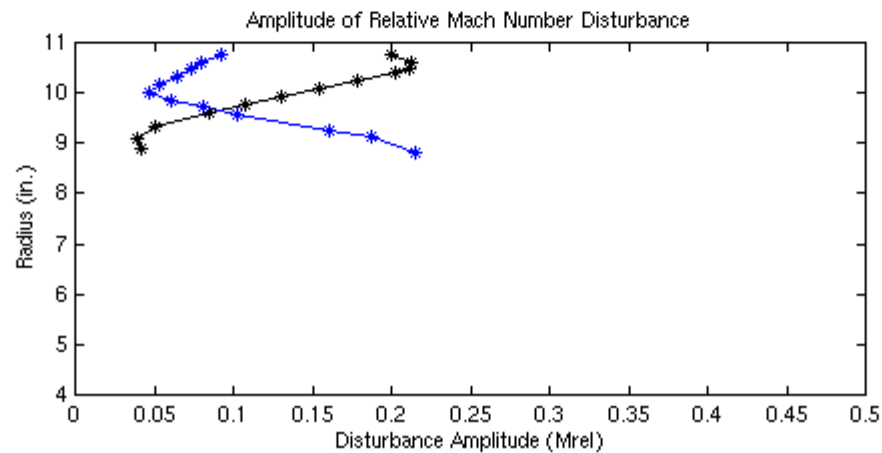
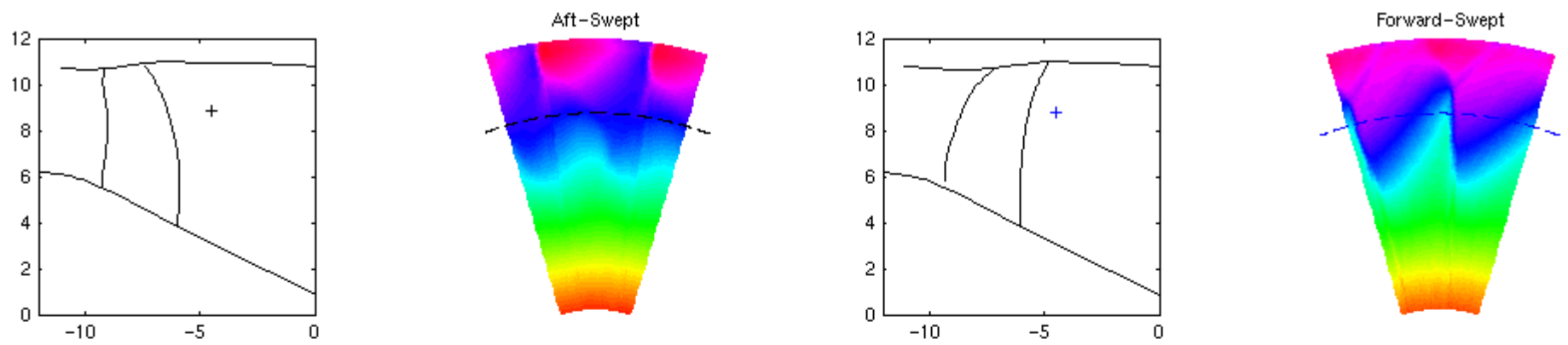
Relative Mach Number Distribution Across Rotor Rev

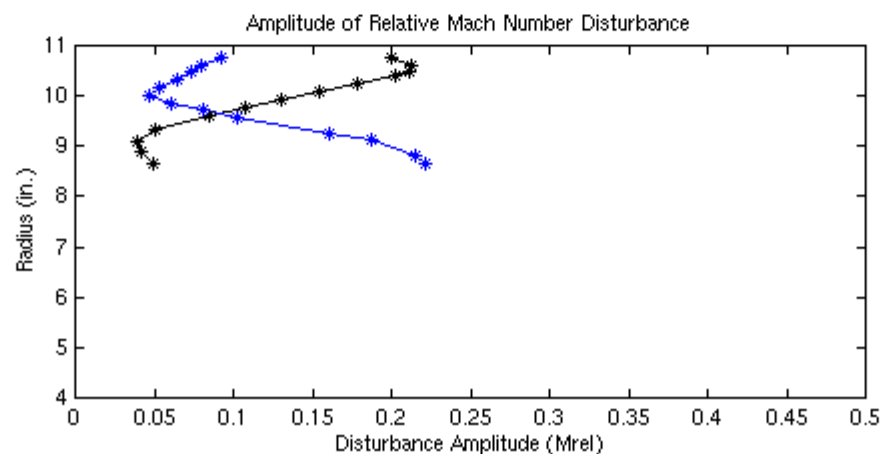
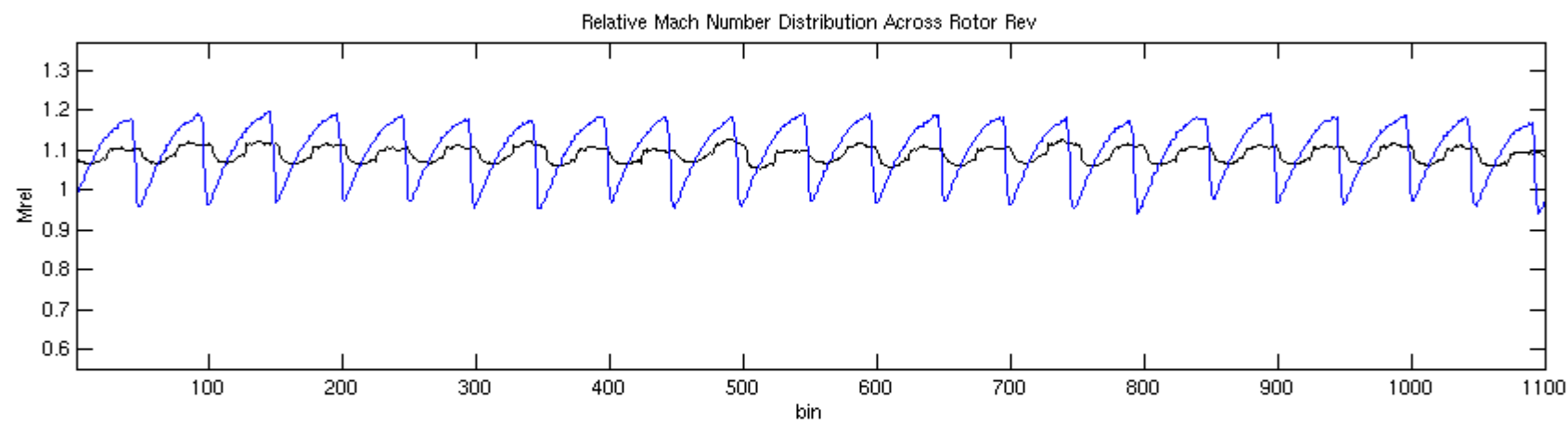
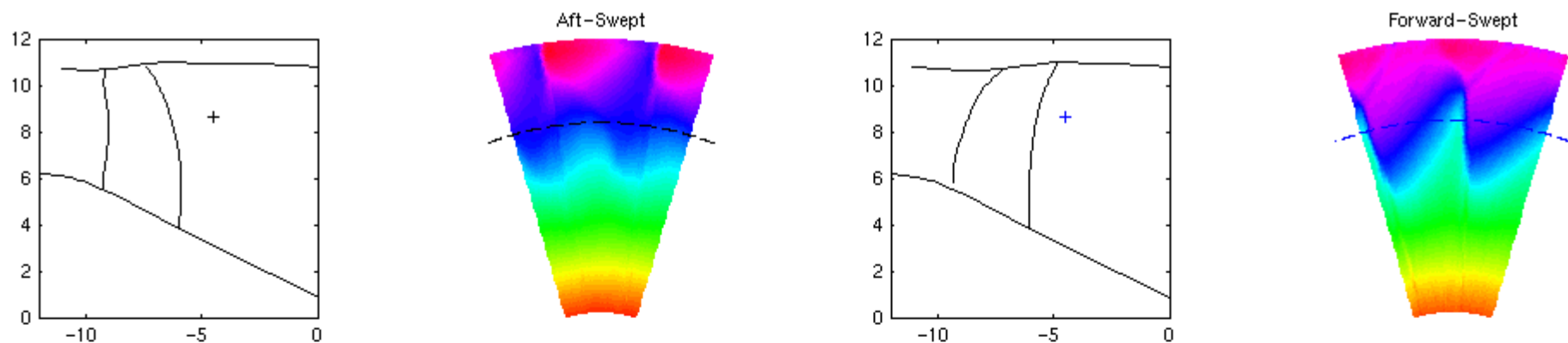


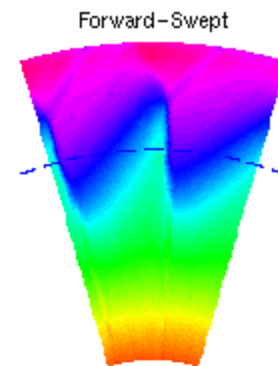
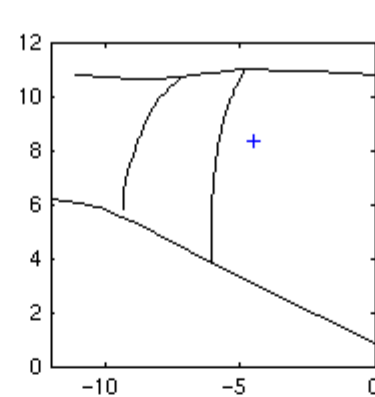
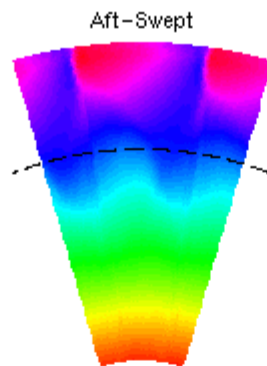
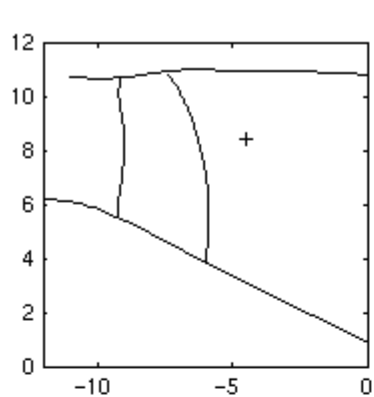


Relative Mach Number Distribution Across Rotor Rev

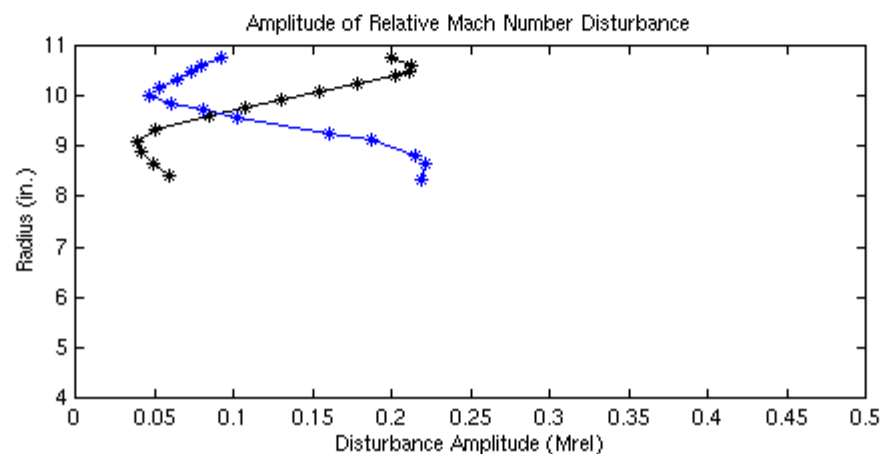
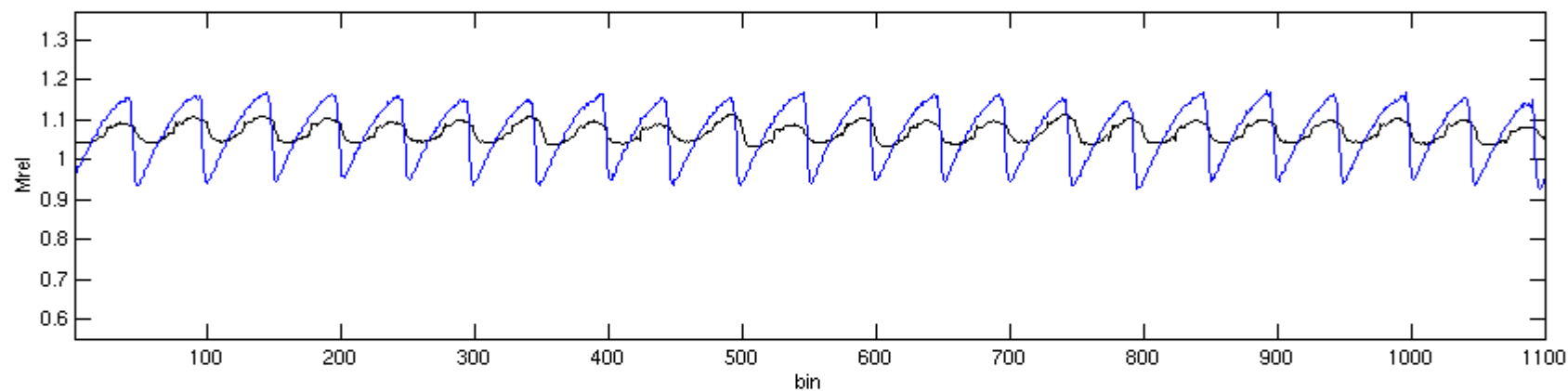


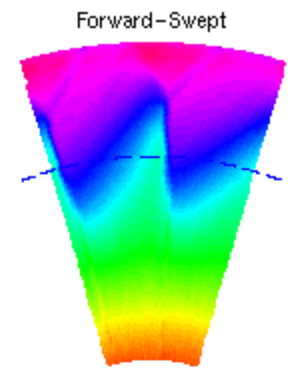
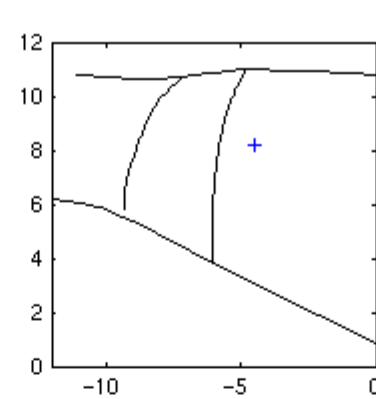
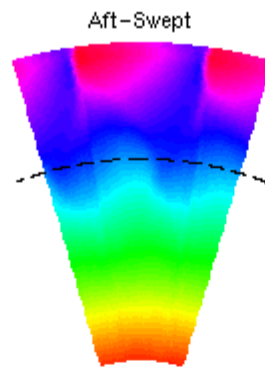
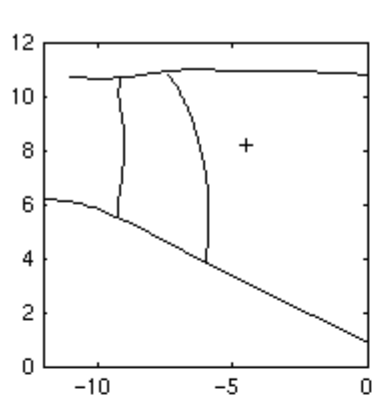




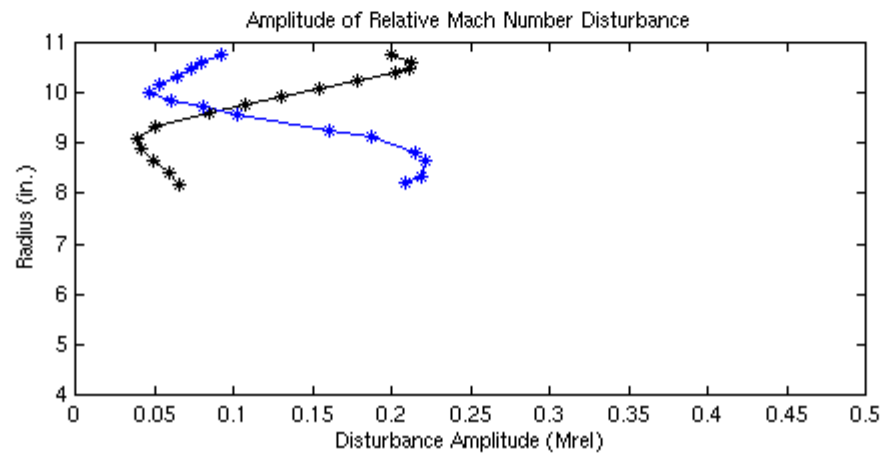
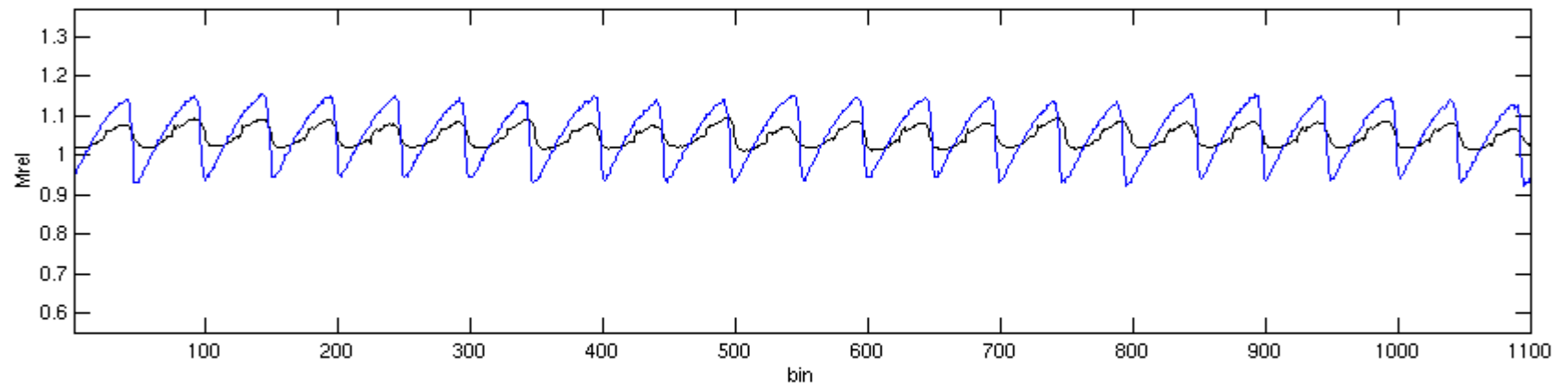


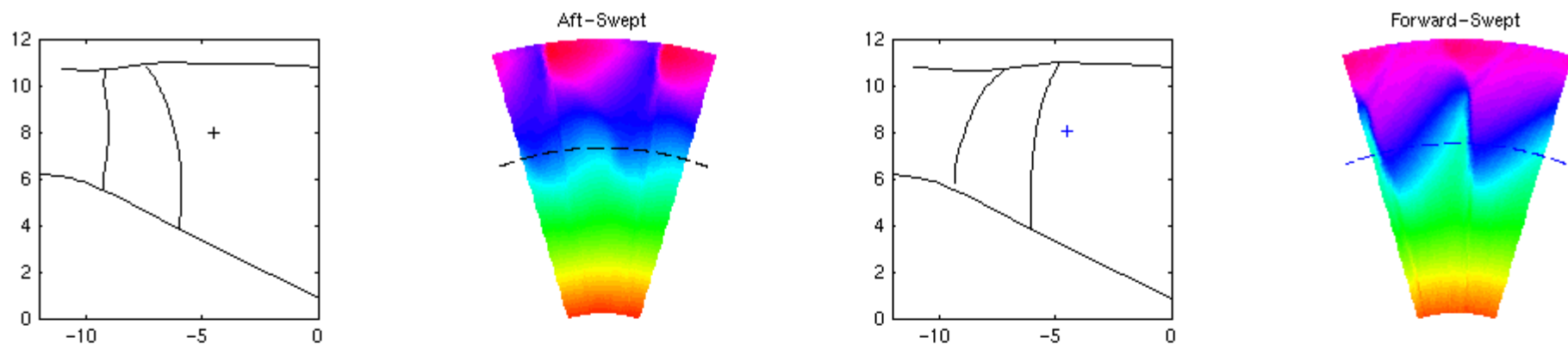
Relative Mach Number Distribution Across Rotor Rev



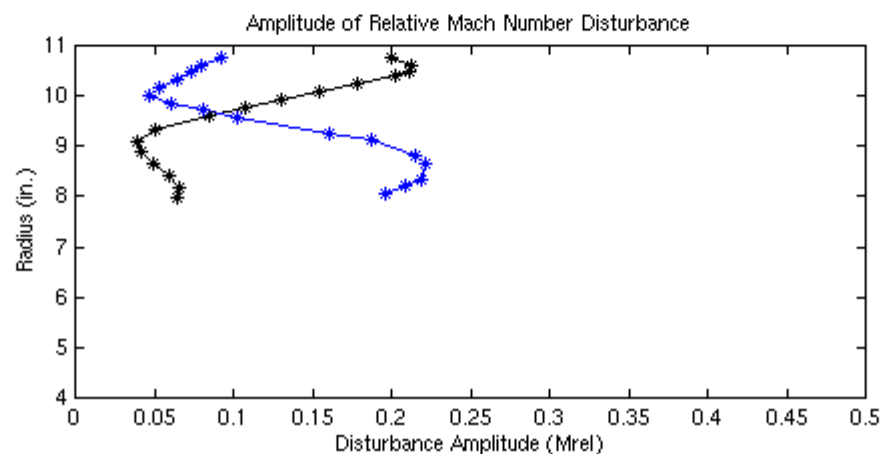
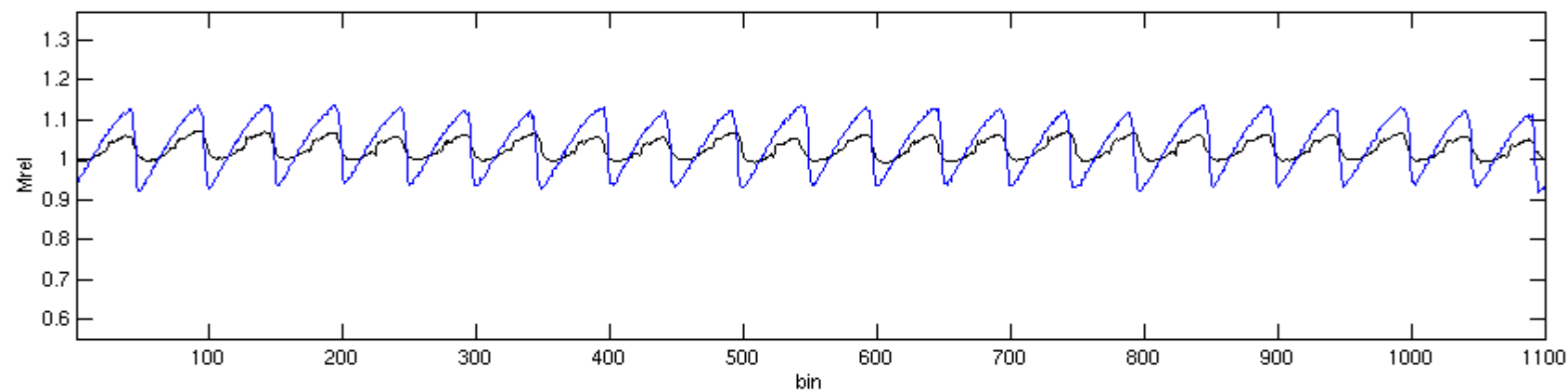


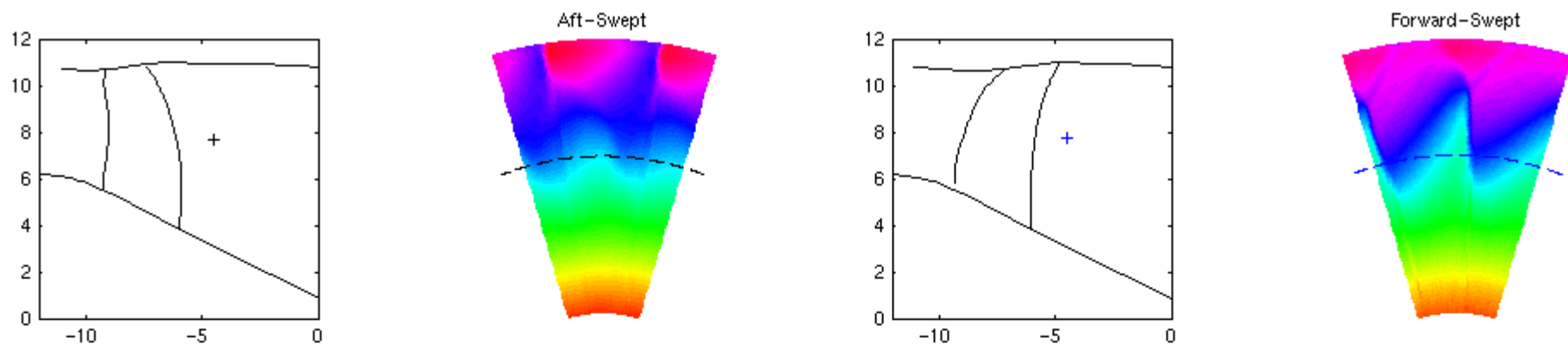
Relative Mach Number Distribution Across Rotor Rev



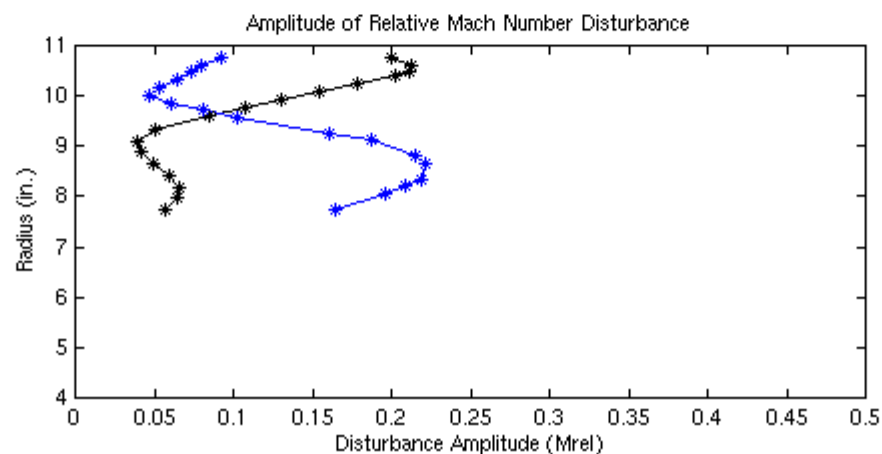
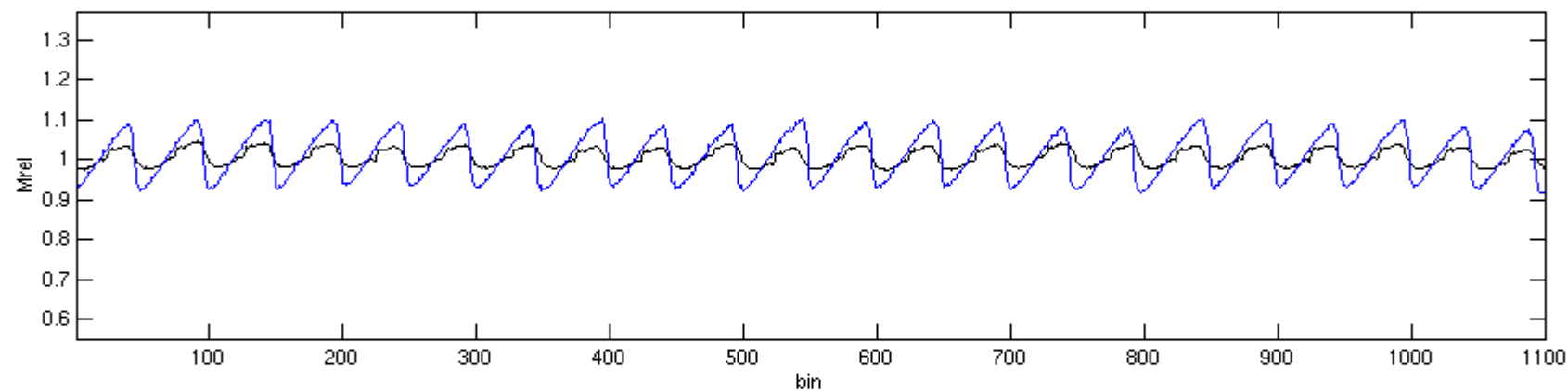


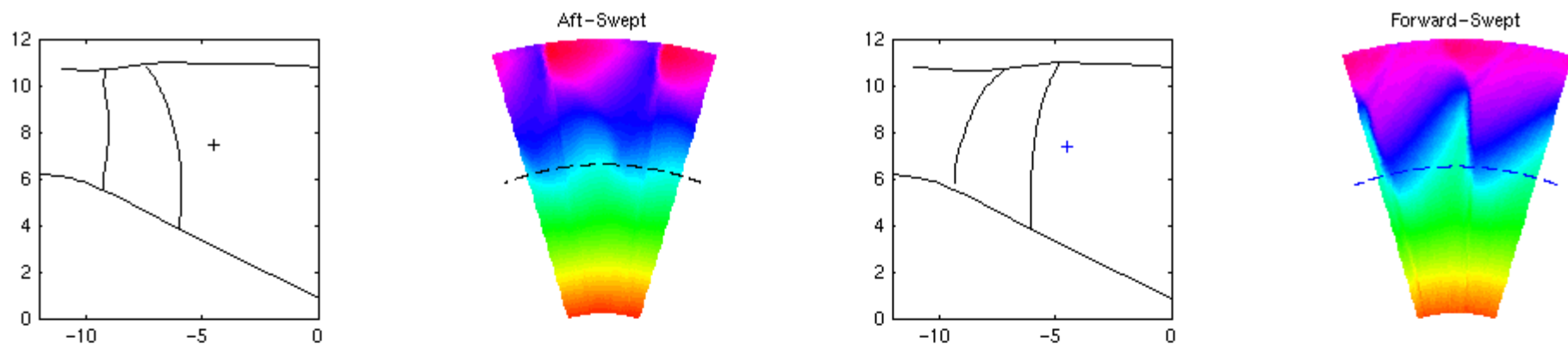
Relative Mach Number Distribution Across Rotor Rev



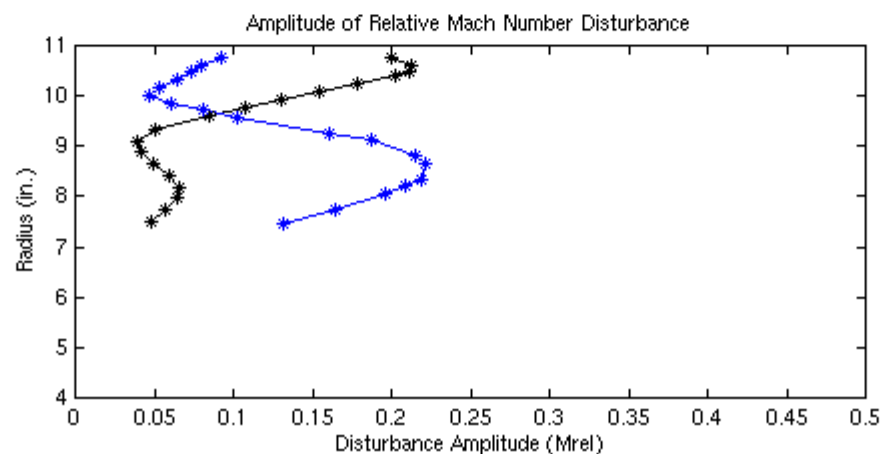
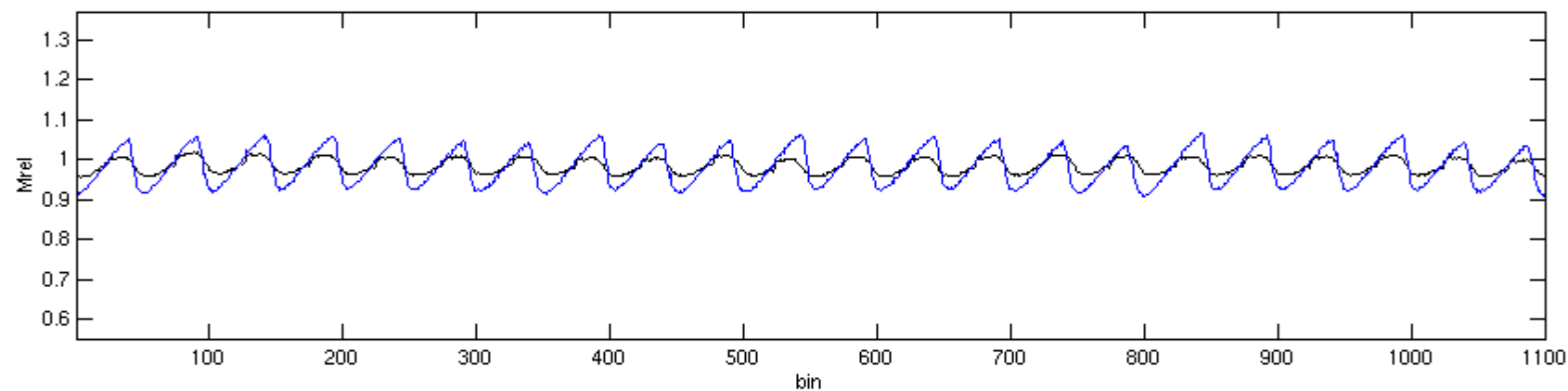


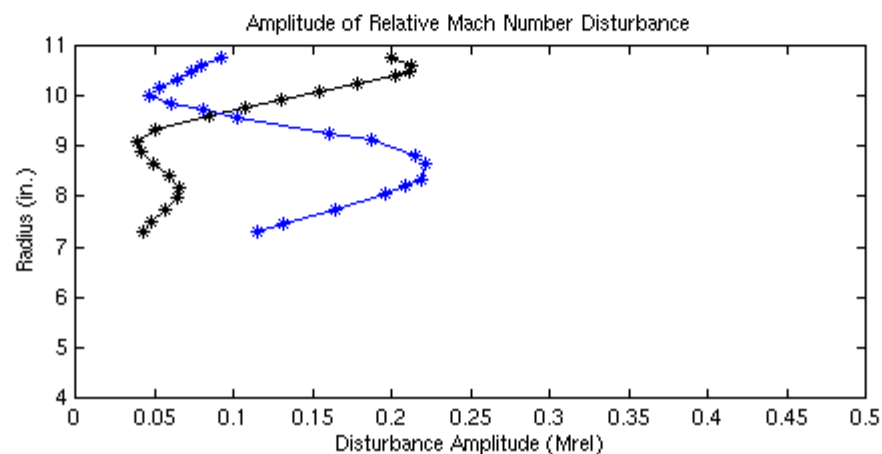
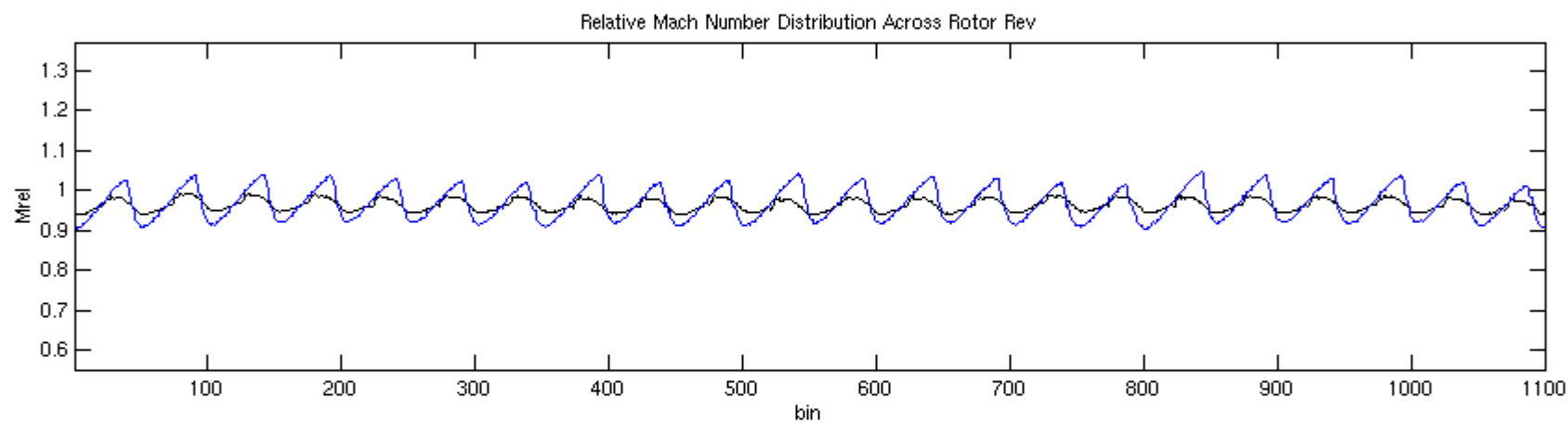
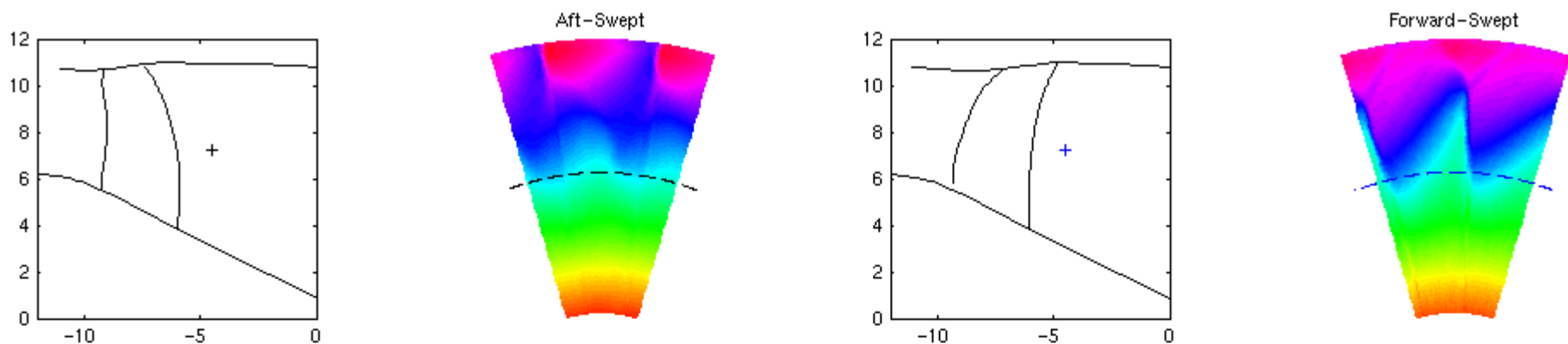
Relative Mach Number Distribution Across Rotor Rev

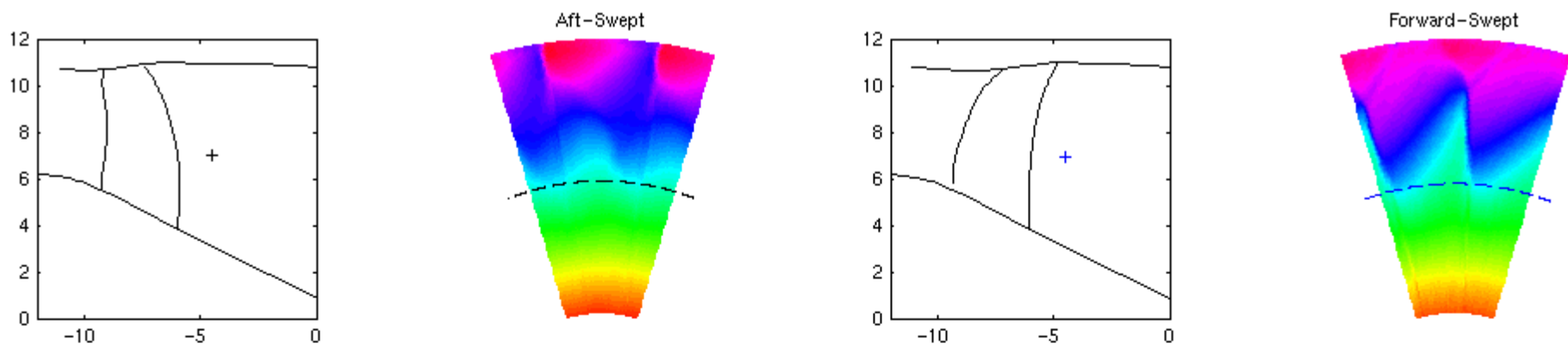




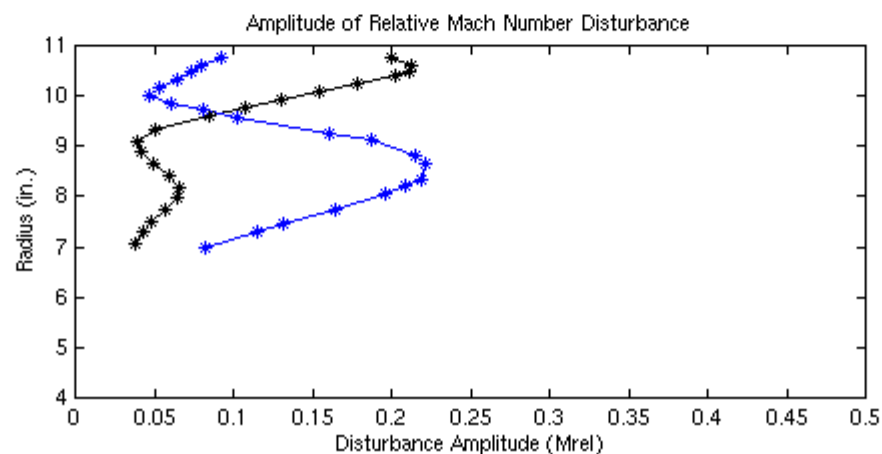
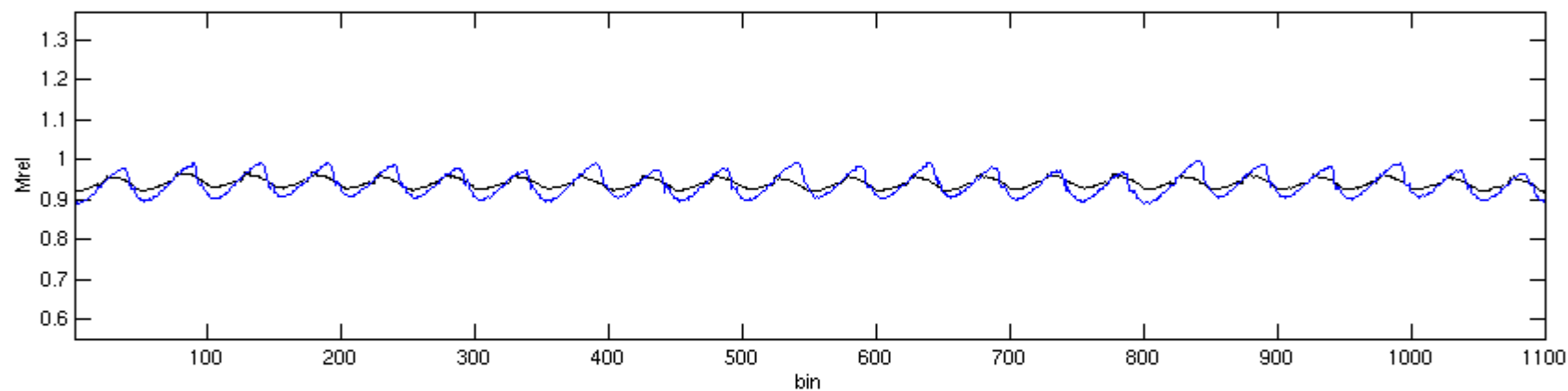
Relative Mach Number Distribution Across Rotor Rev

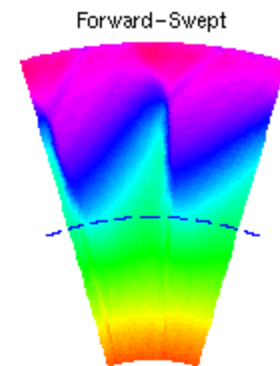
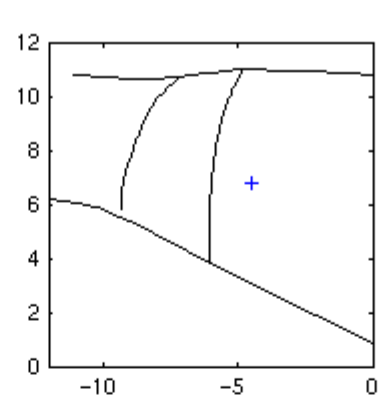
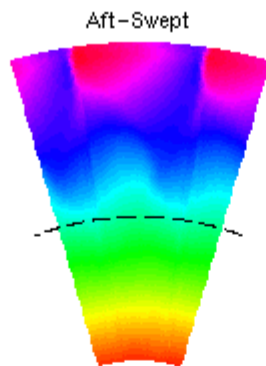
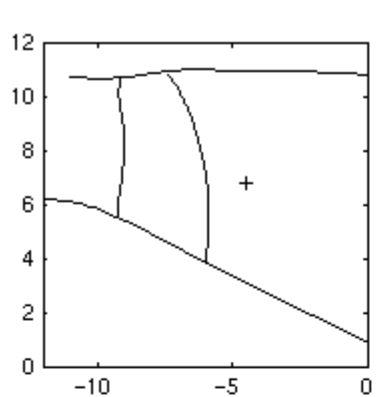




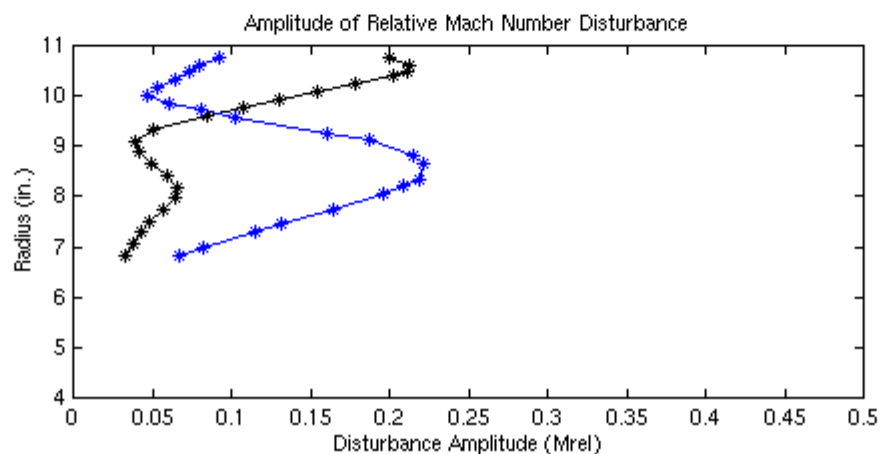
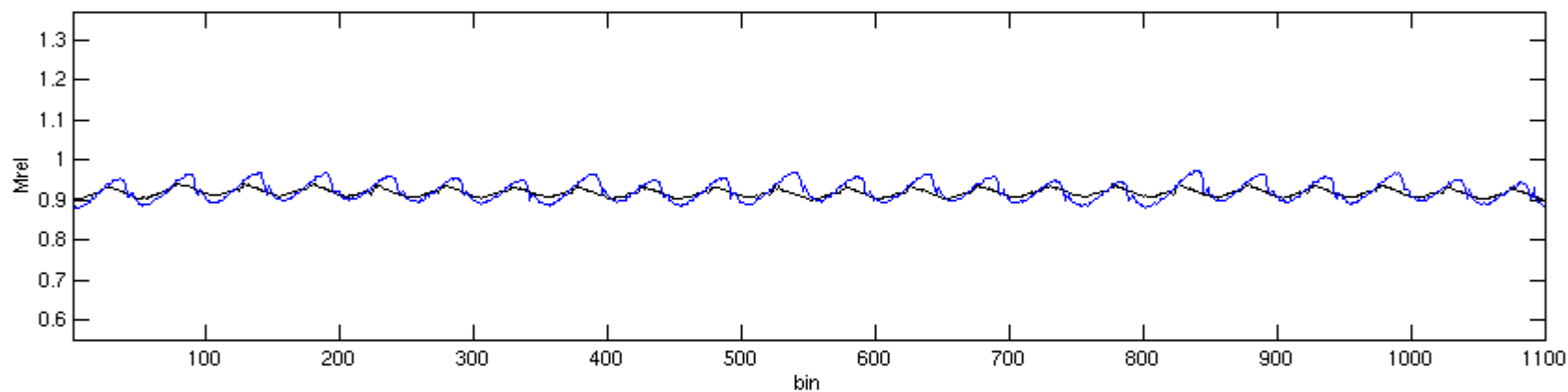


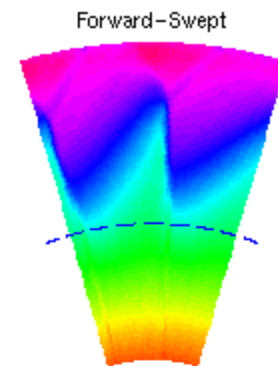
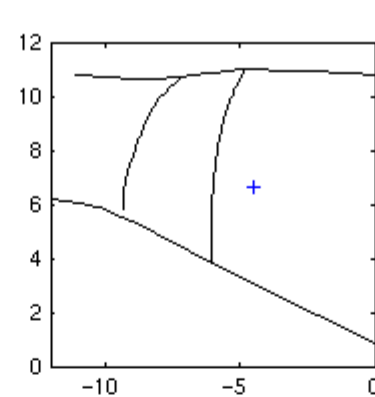
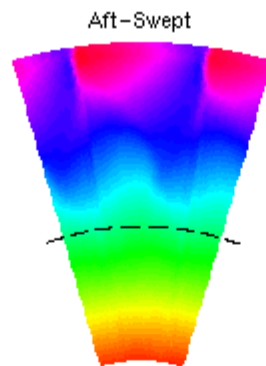
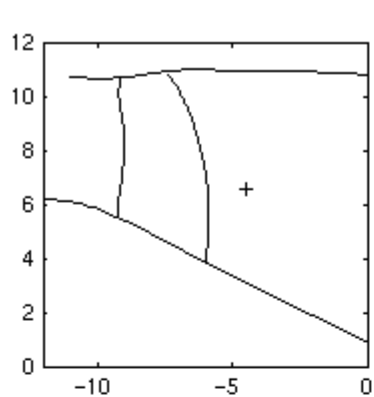
Relative Mach Number Distribution Across Rotor Rev



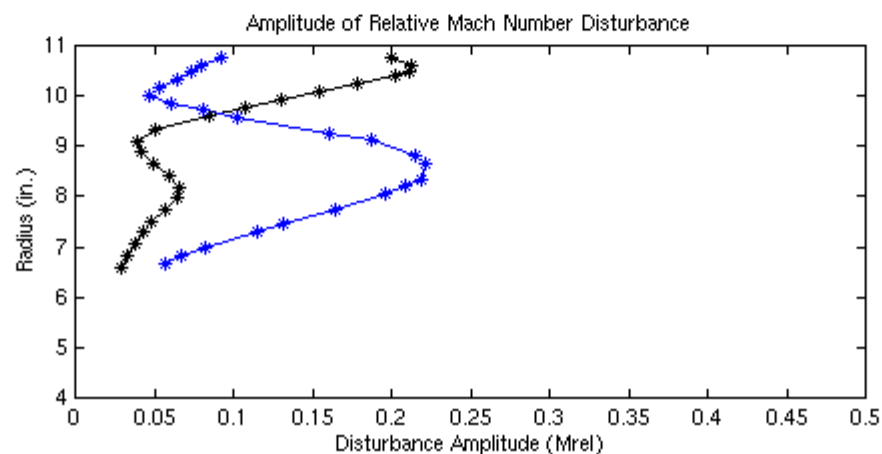
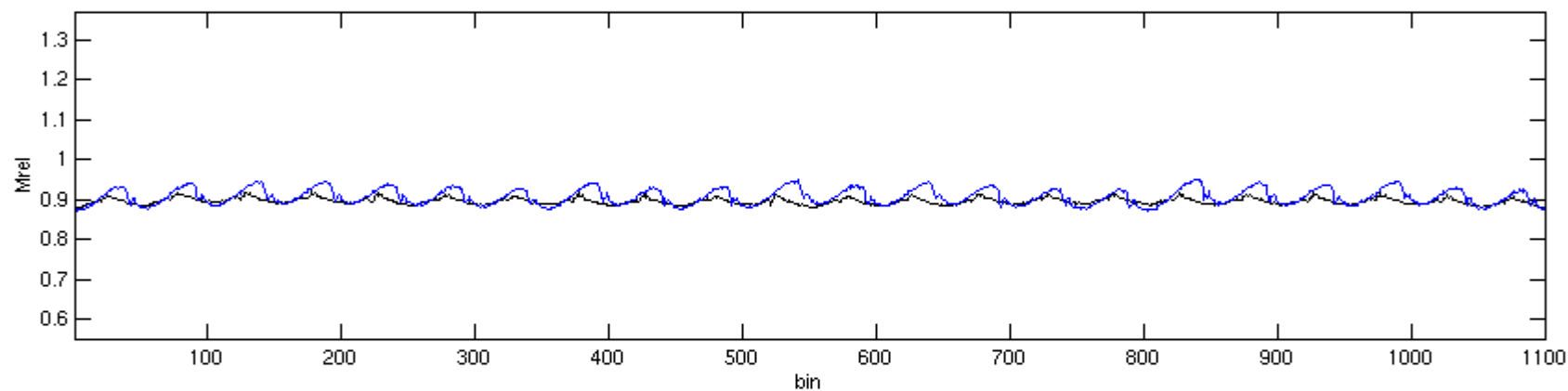


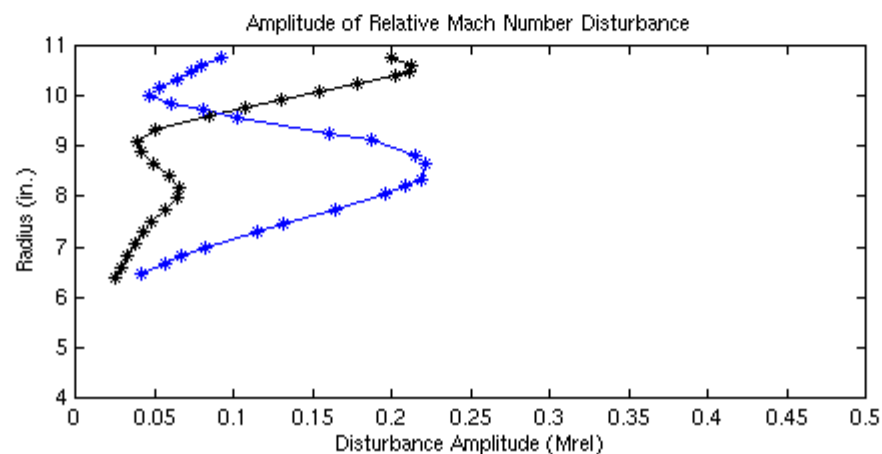
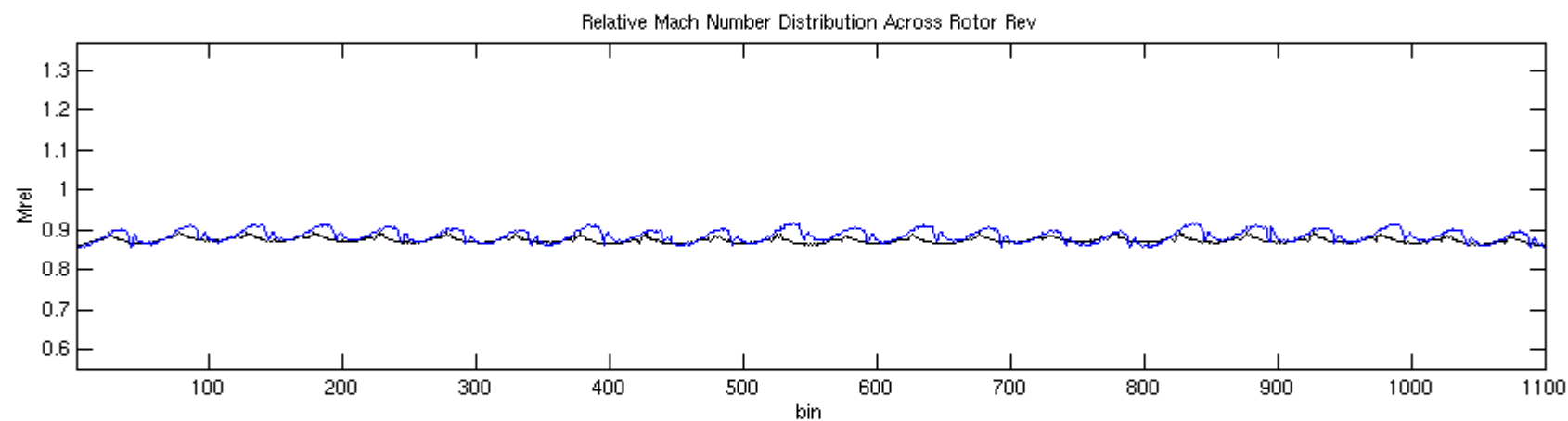
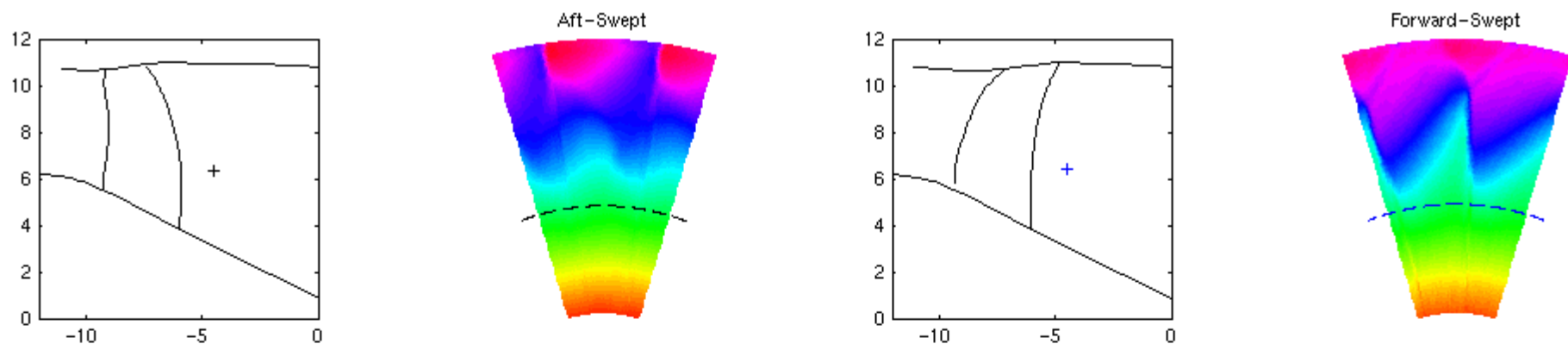
Relative Mach Number Distribution Across Rotor Rev

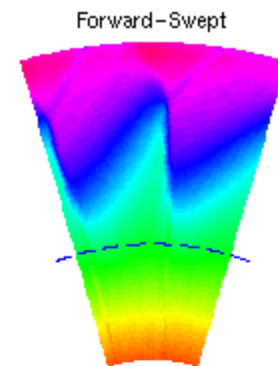
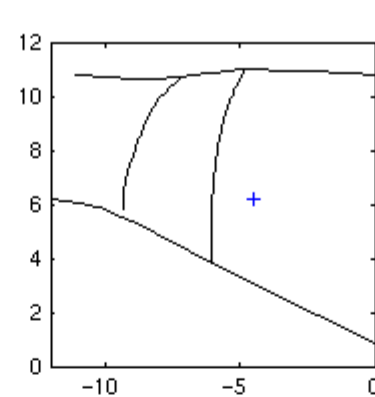
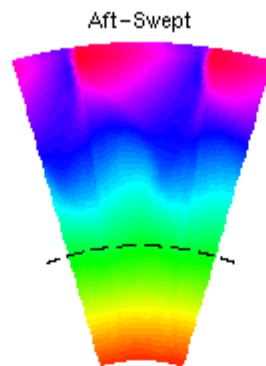
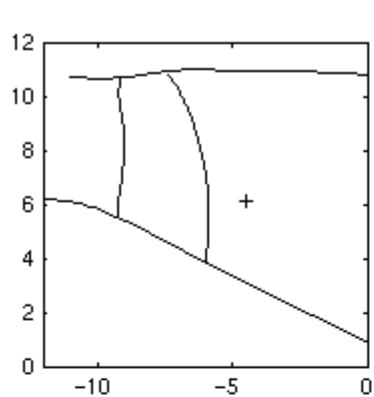




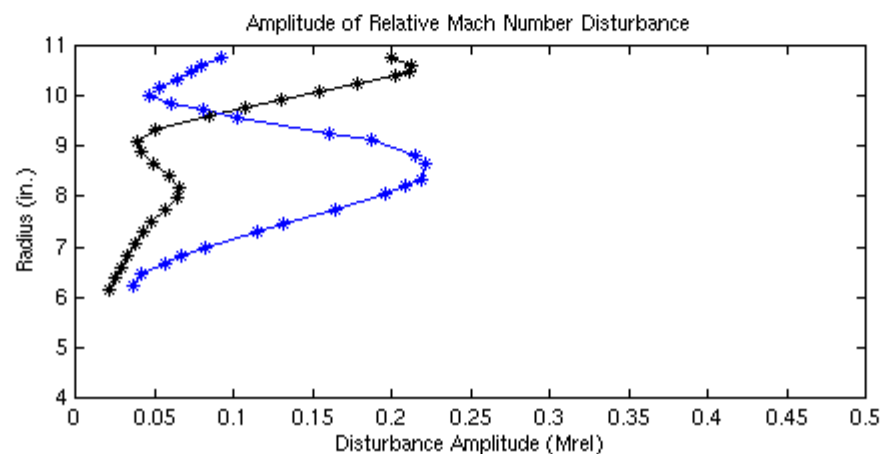
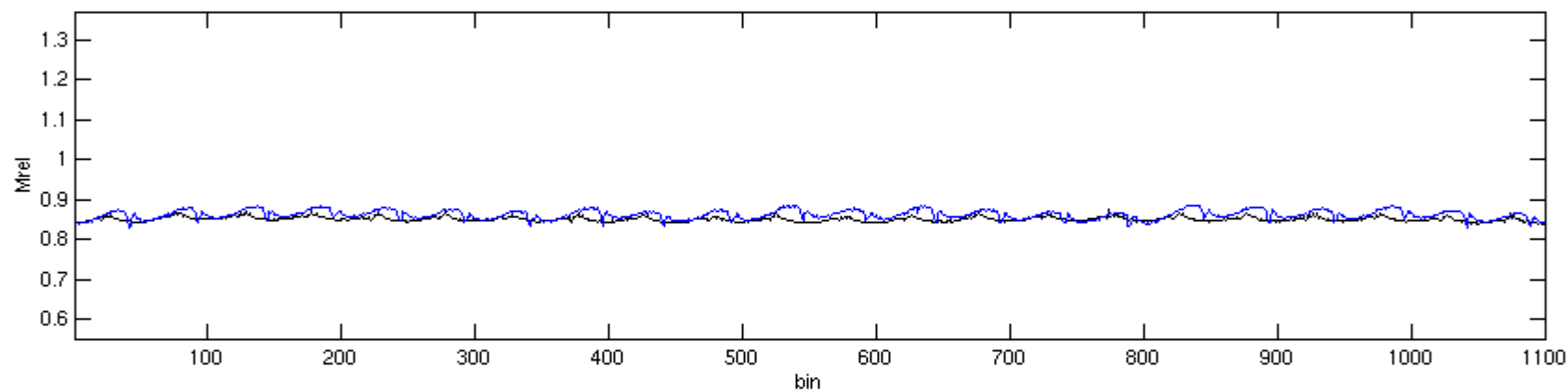
Relative Mach Number Distribution Across Rotor Rev

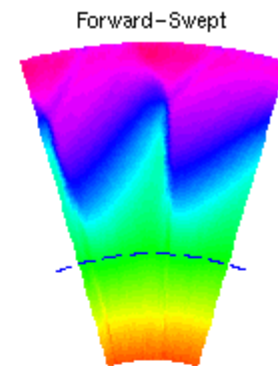
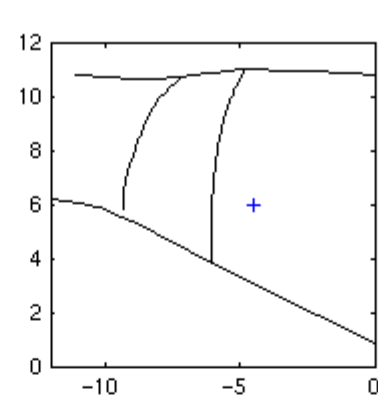
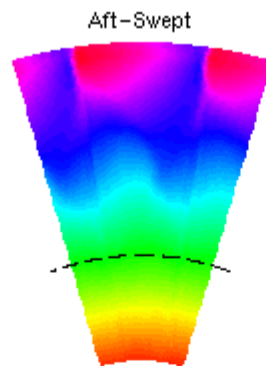
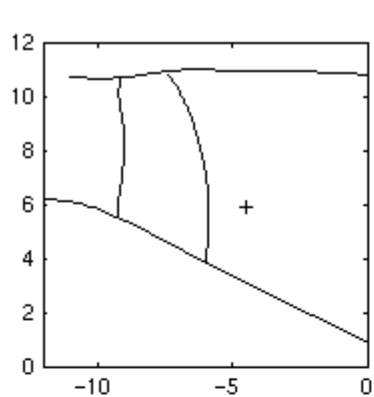




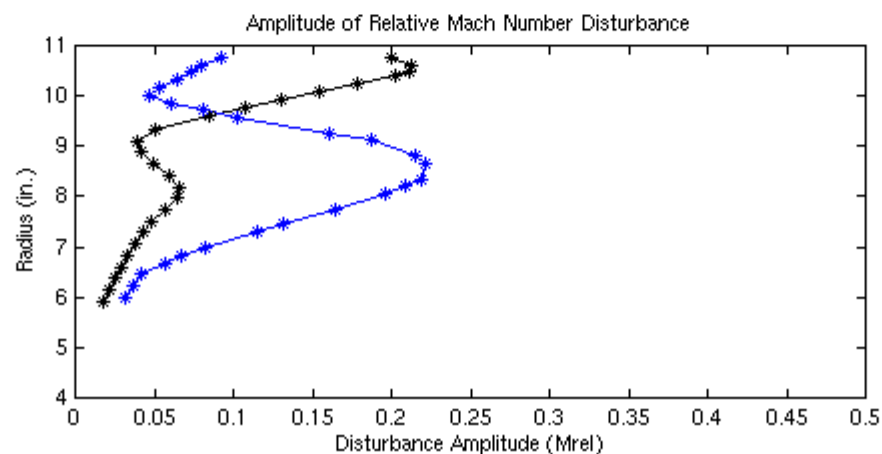
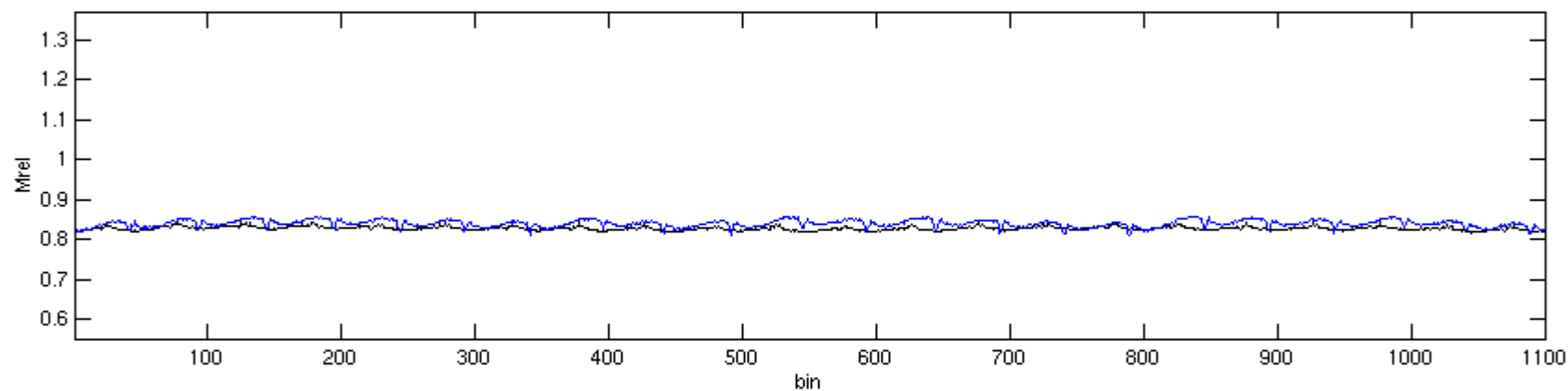


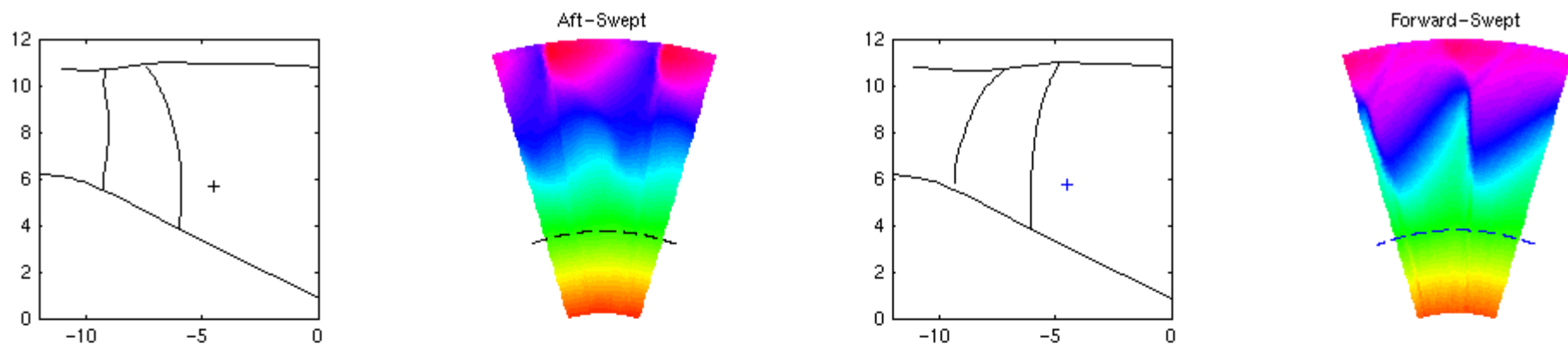
Relative Mach Number Distribution Across Rotor Rev



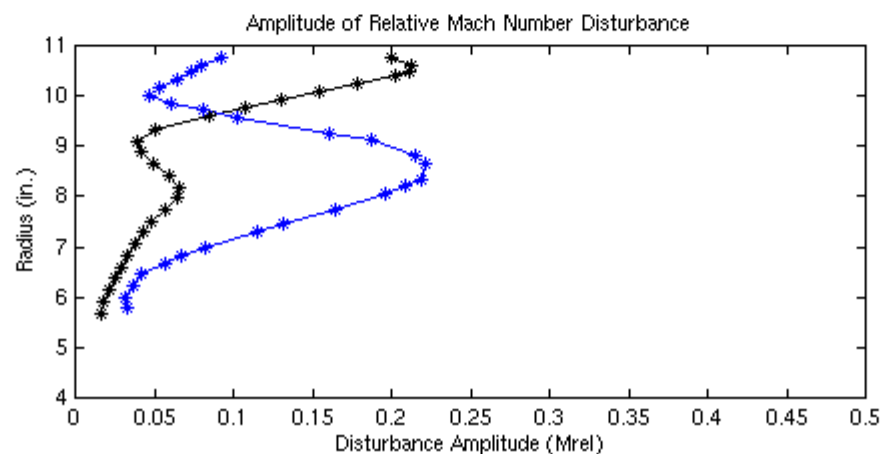
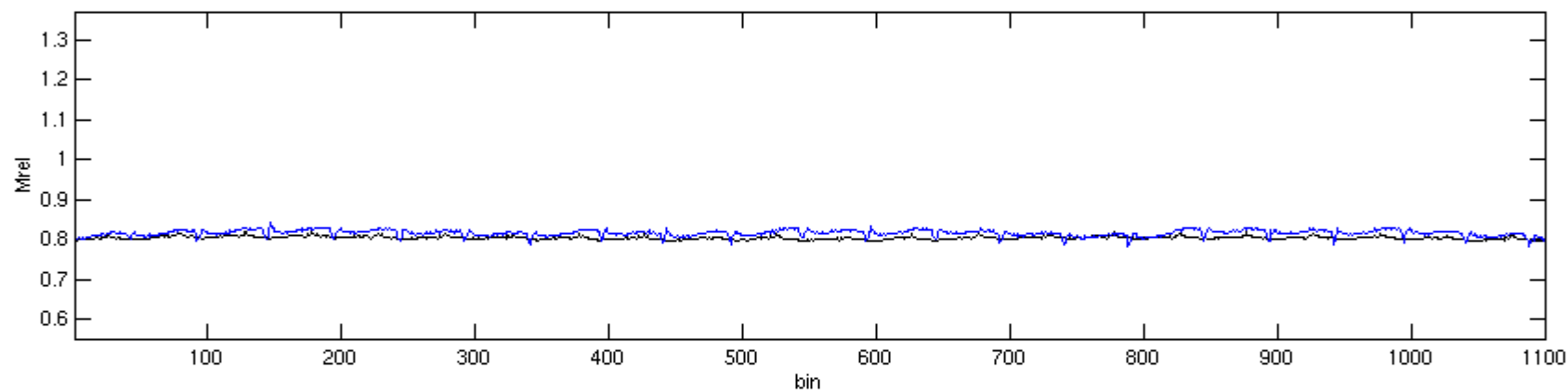


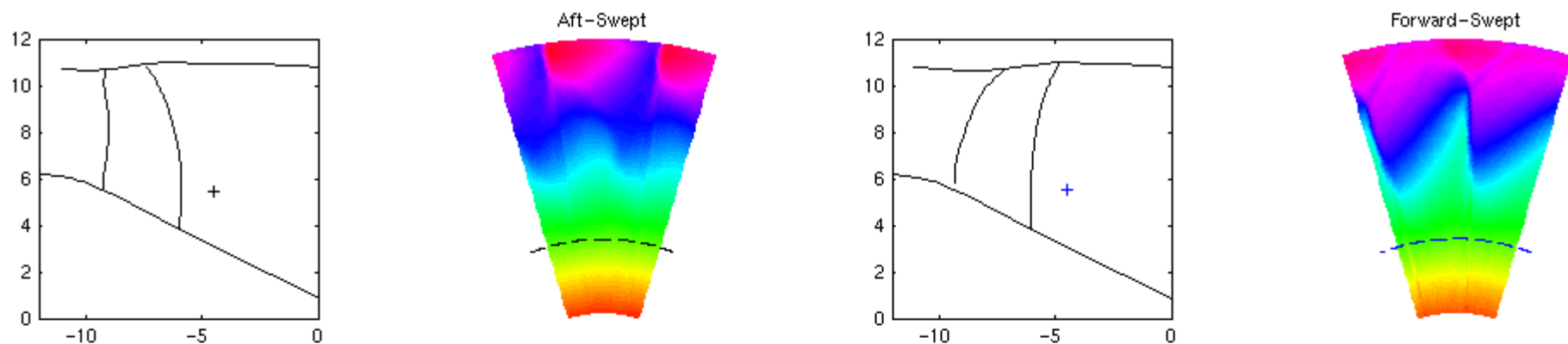
Relative Mach Number Distribution Across Rotor Rev



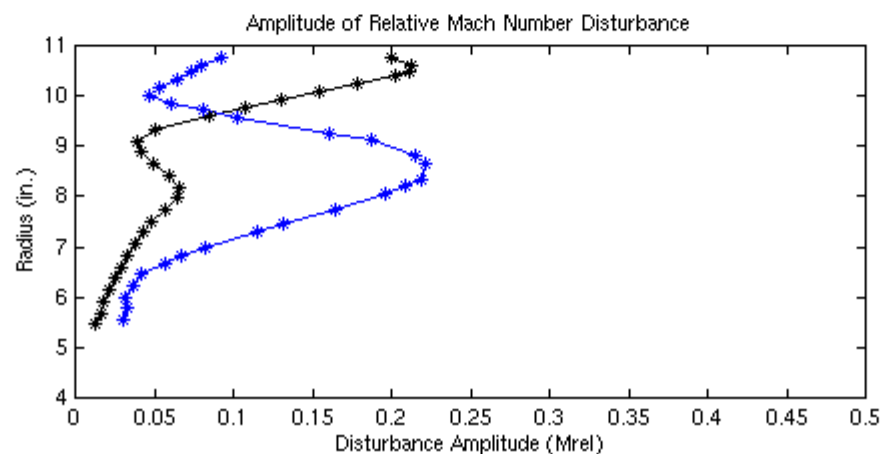
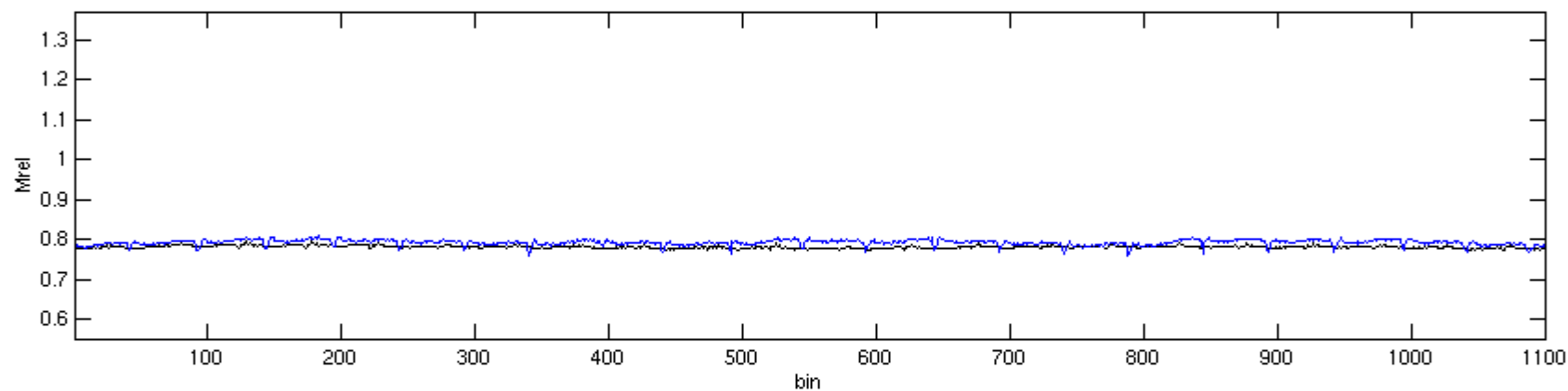


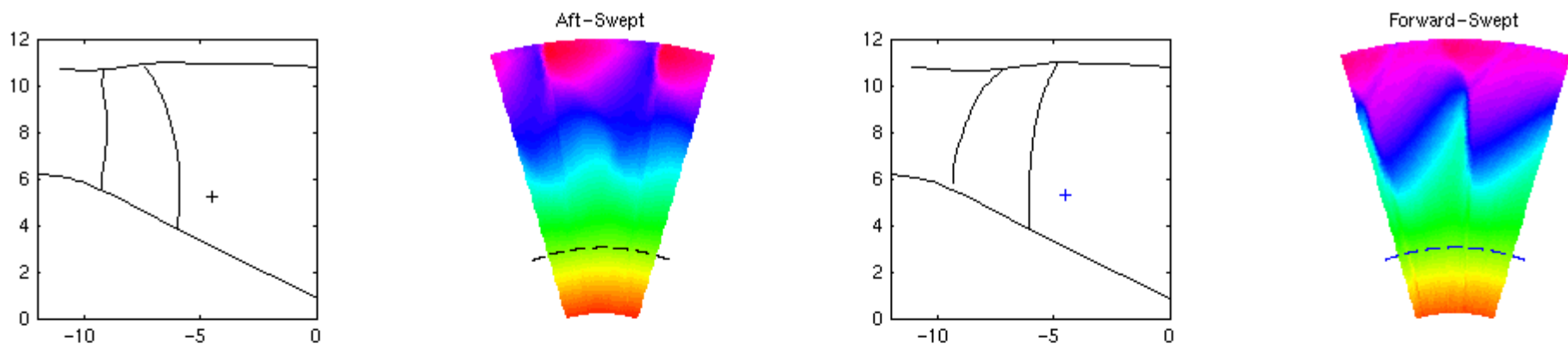
Relative Mach Number Distribution Across Rotor Rev



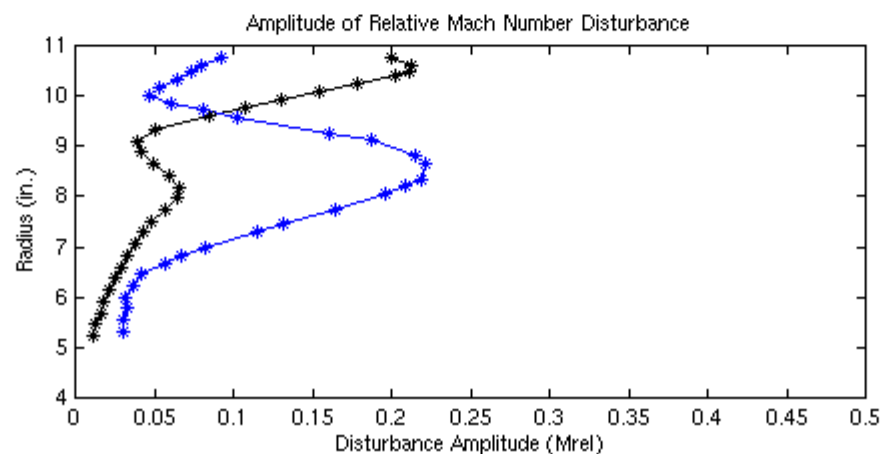
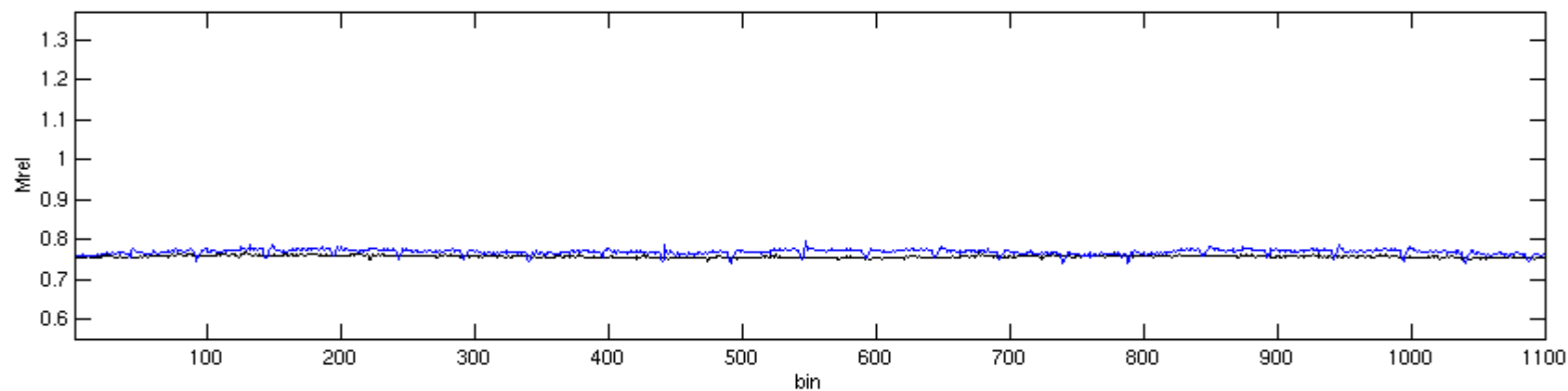


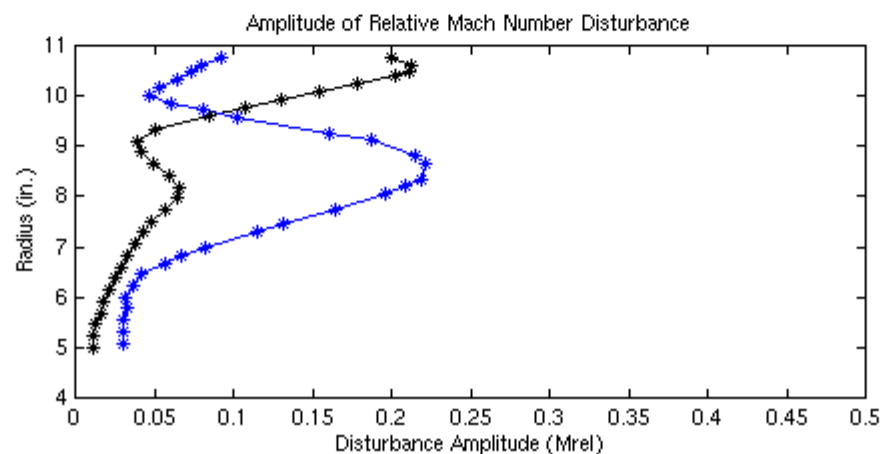
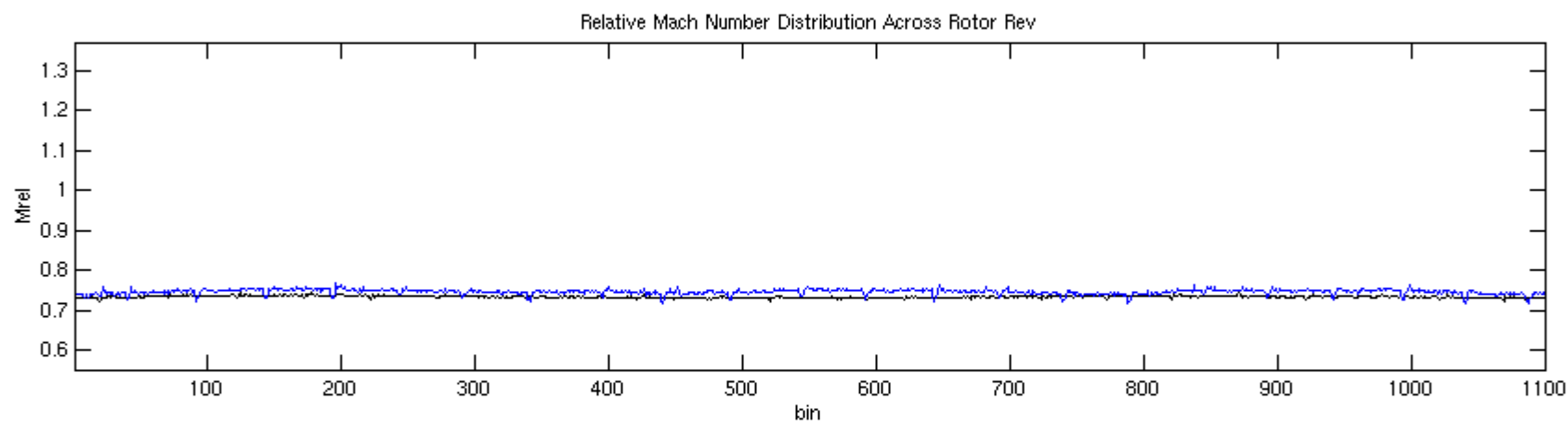
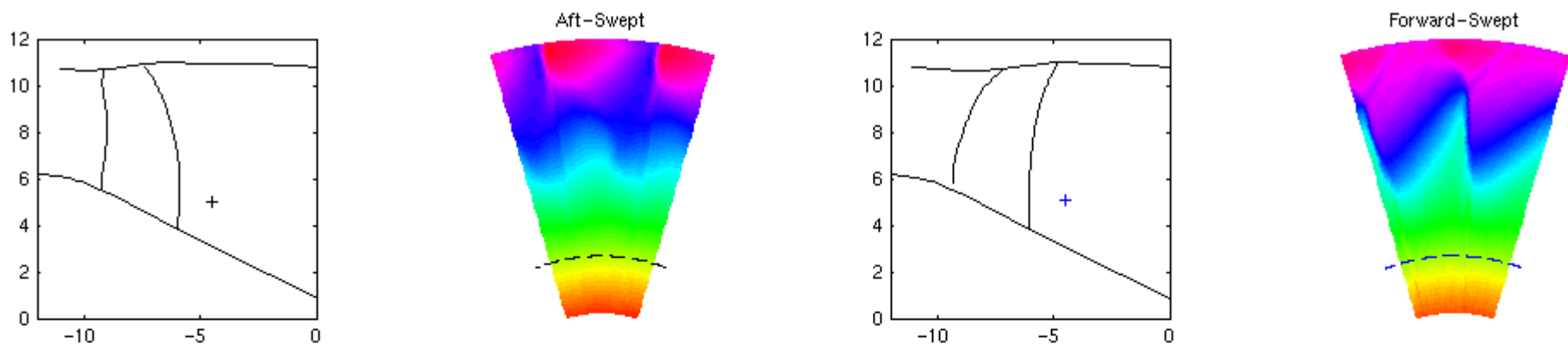
Relative Mach Number Distribution Across Rotor Rev

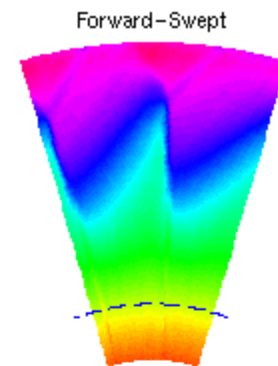
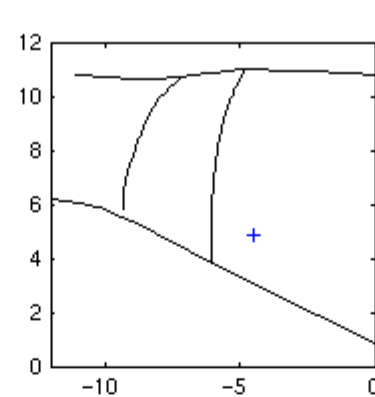
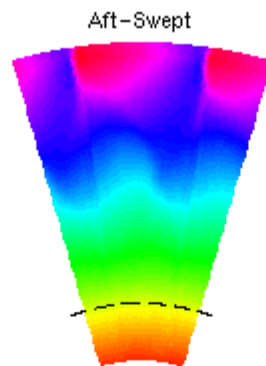
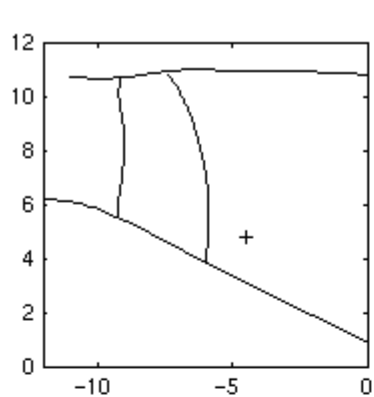




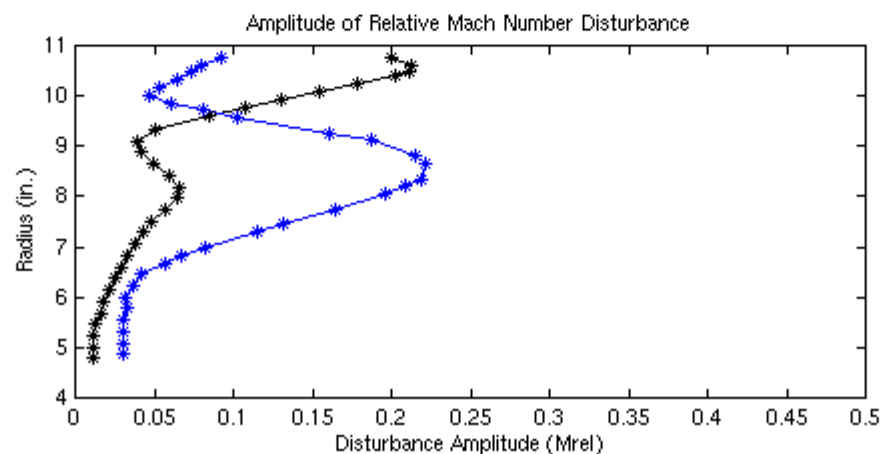
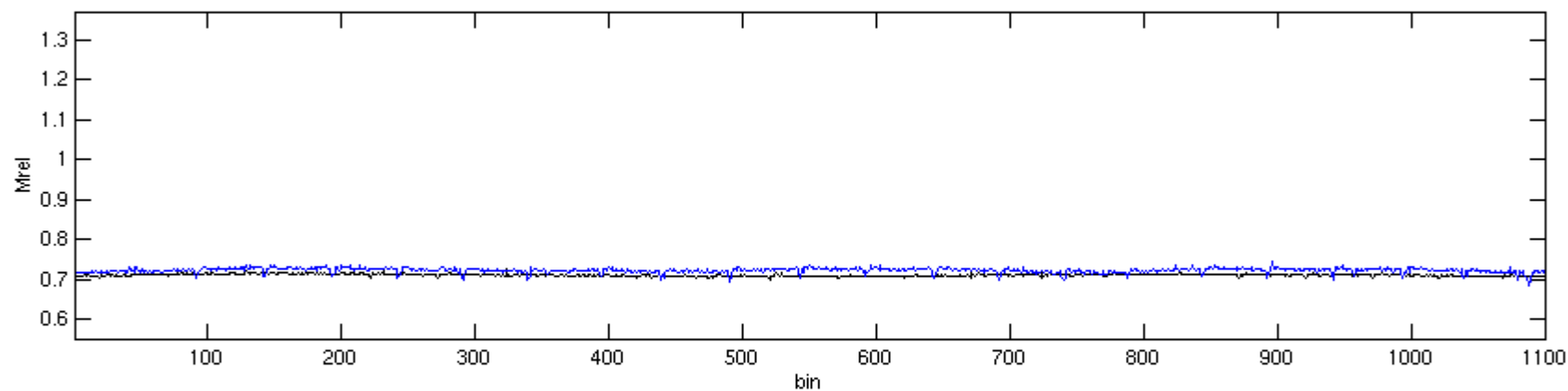
Relative Mach Number Distribution Across Rotor Rev

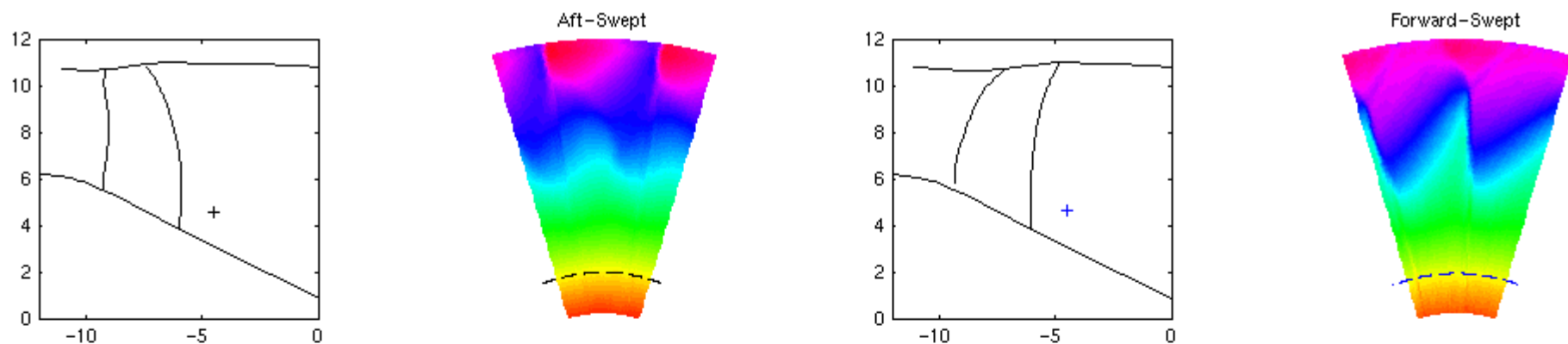




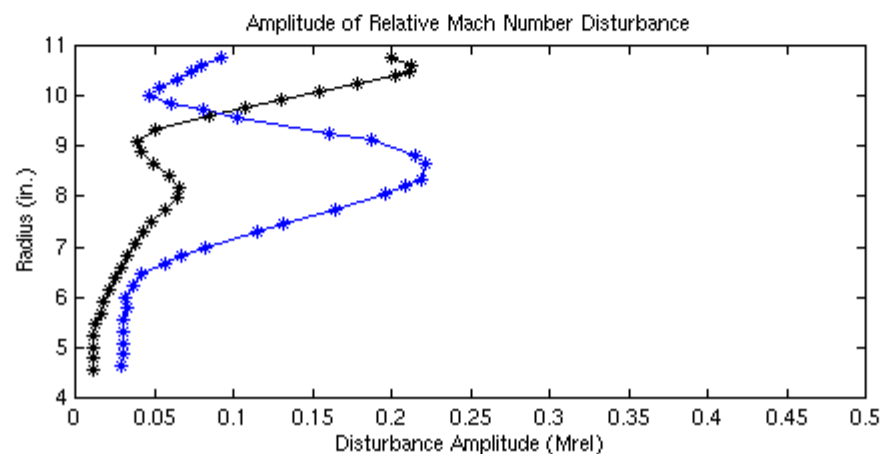
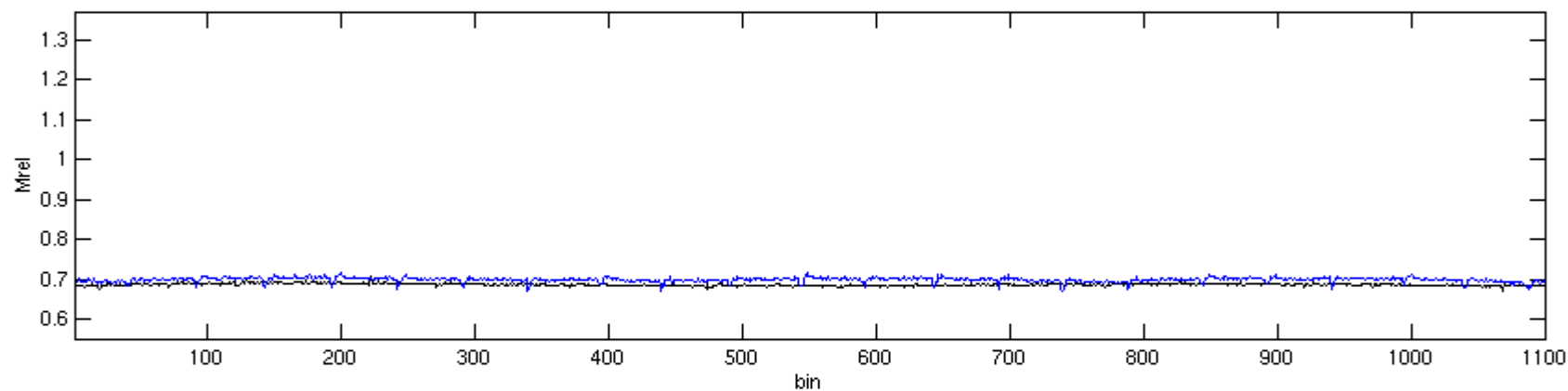


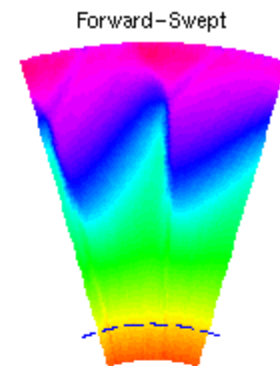
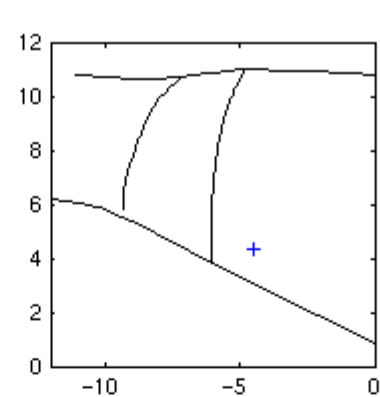
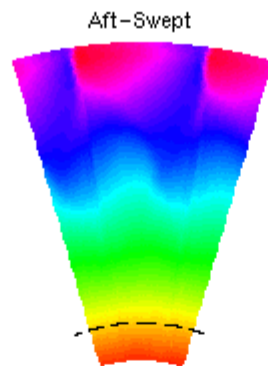
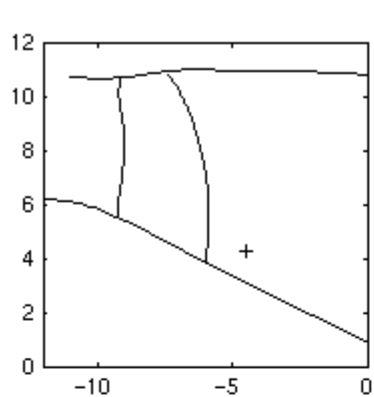
Relative Mach Number Distribution Across Rotor Rev



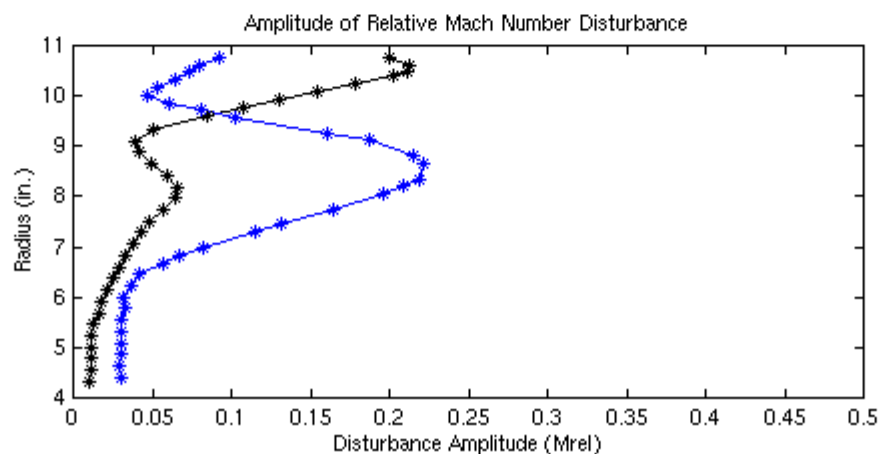
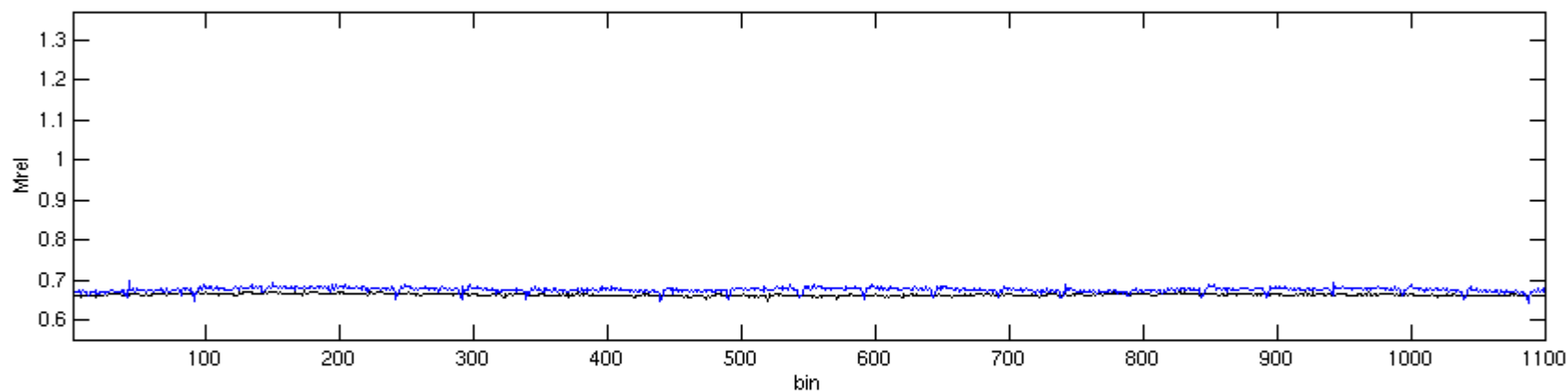


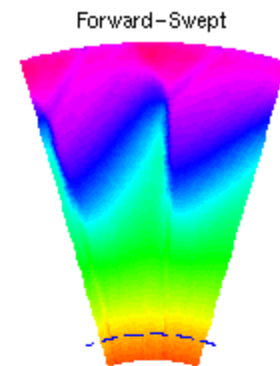
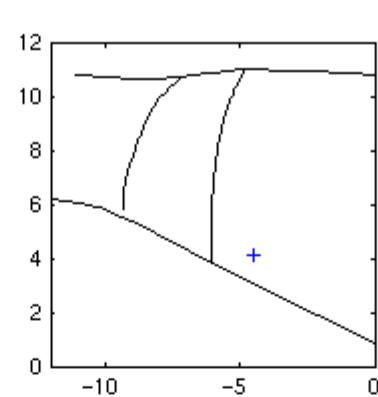
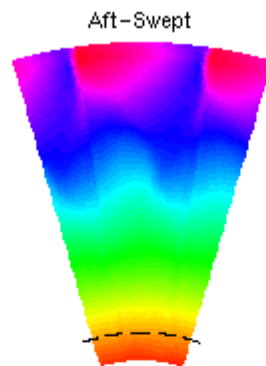
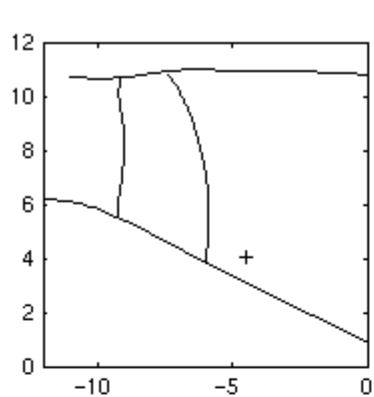
Relative Mach Number Distribution Across Rotor Rev



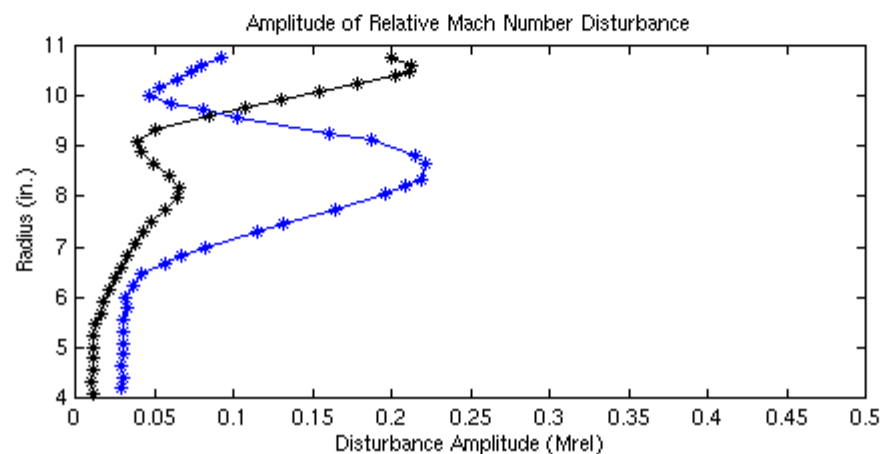
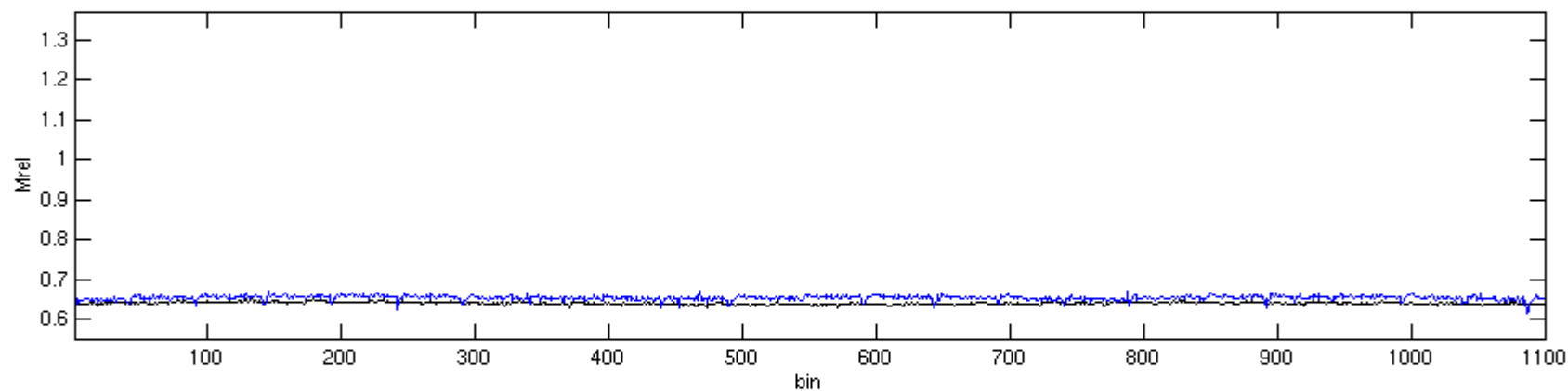


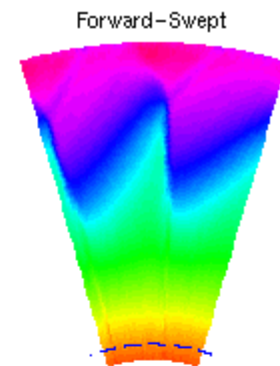
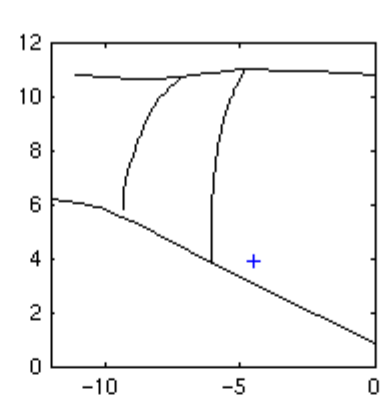
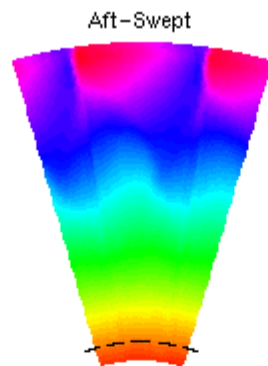
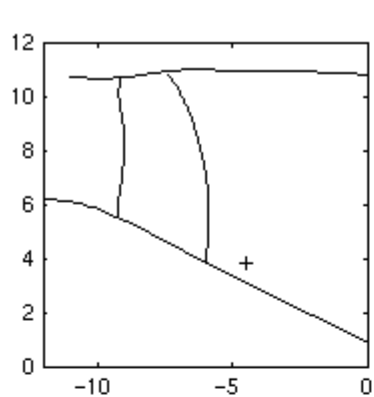
Relative Mach Number Distribution Across Rotor Rev



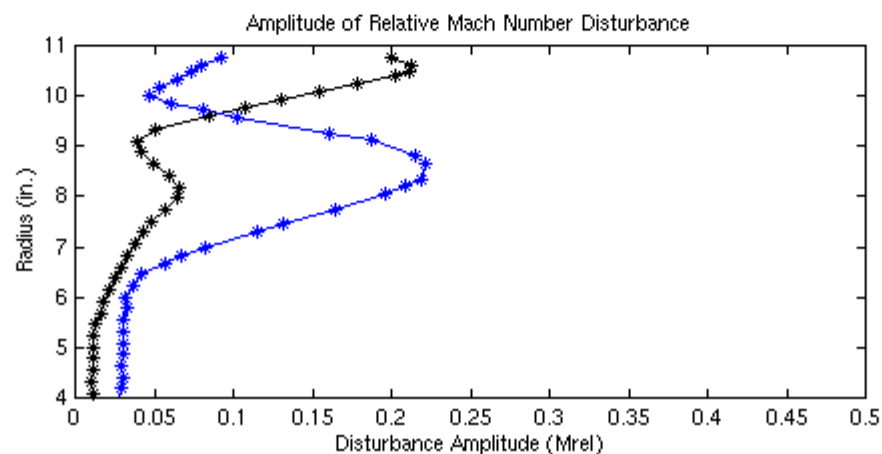
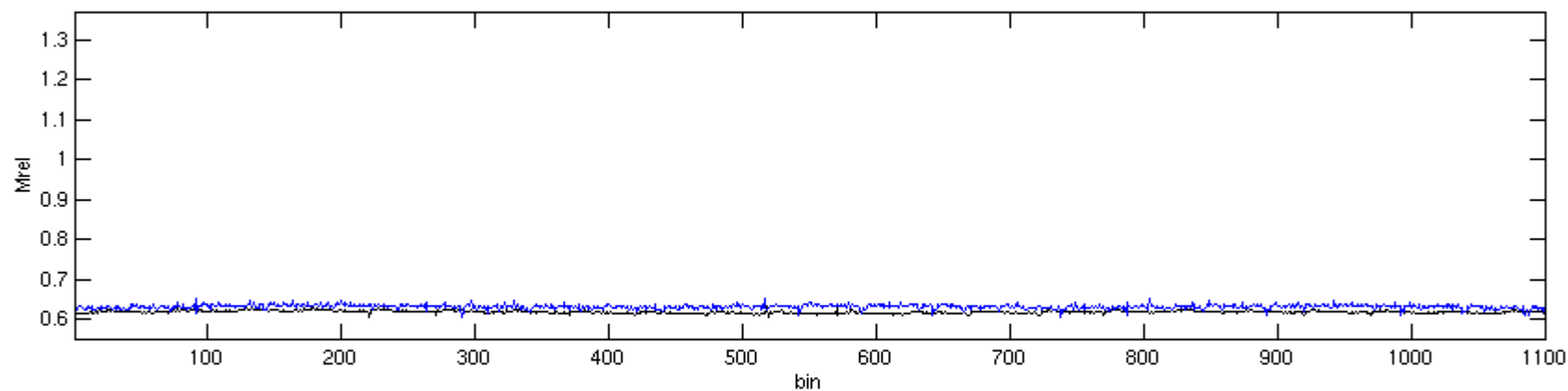


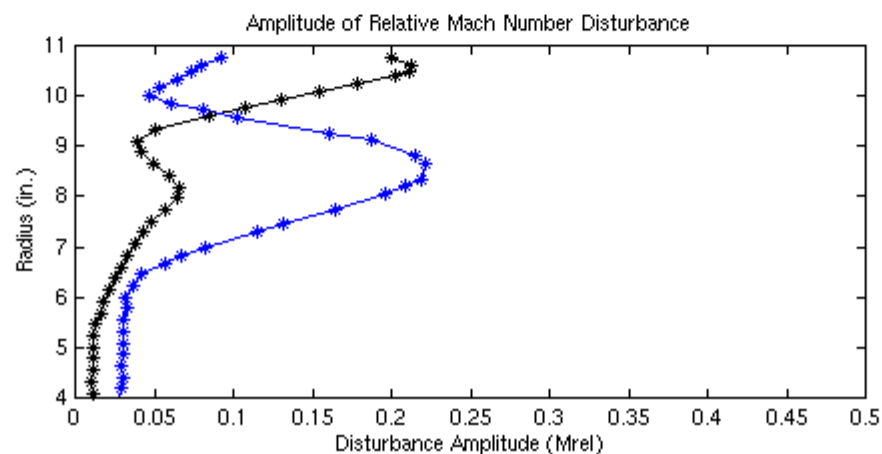
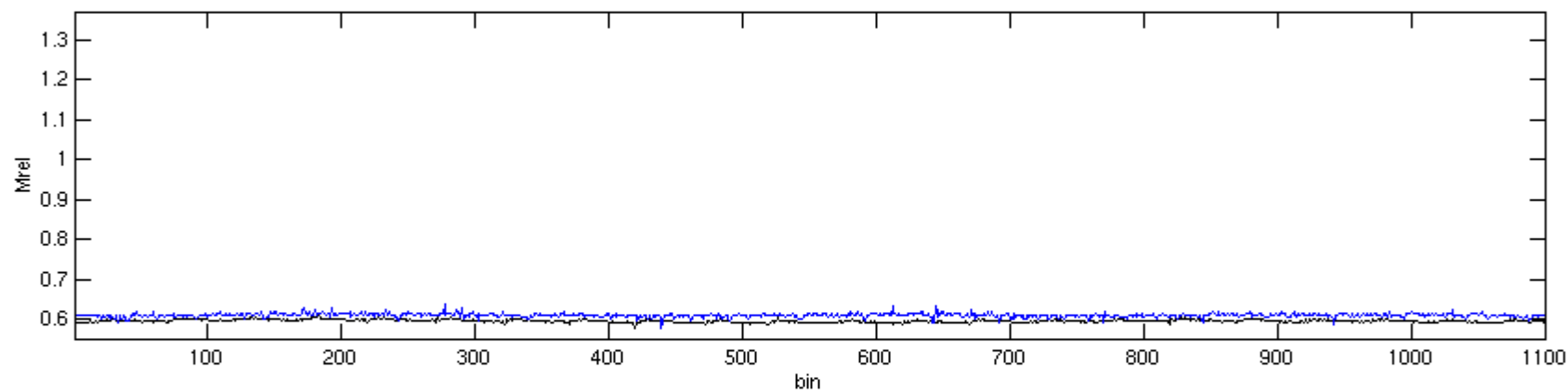
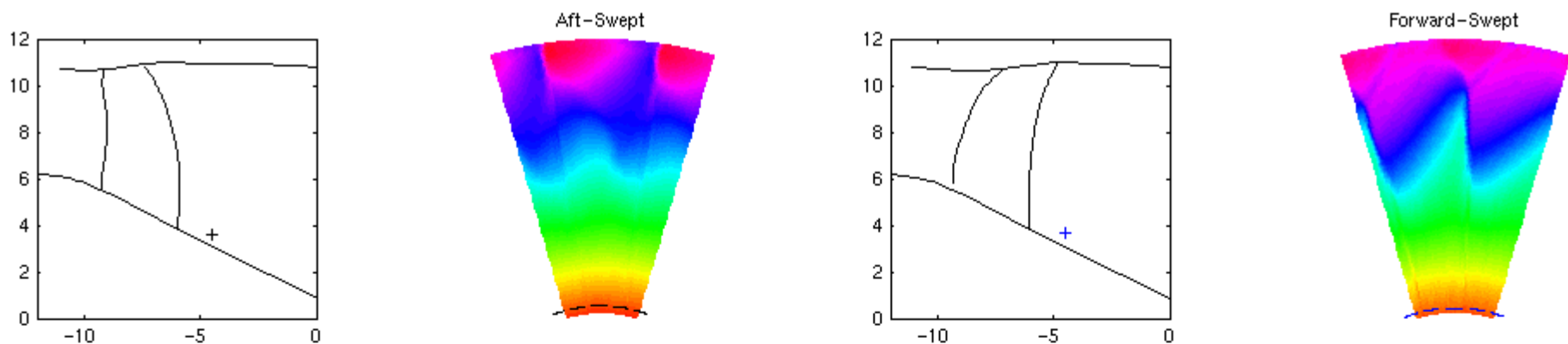
Relative Mach Number Distribution Across Rotor Rev





Relative Mach Number Distribution Across Rotor Rev





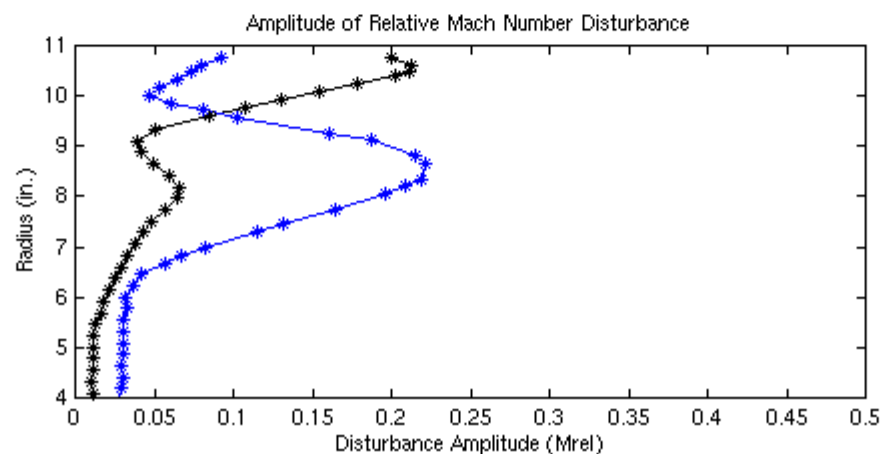
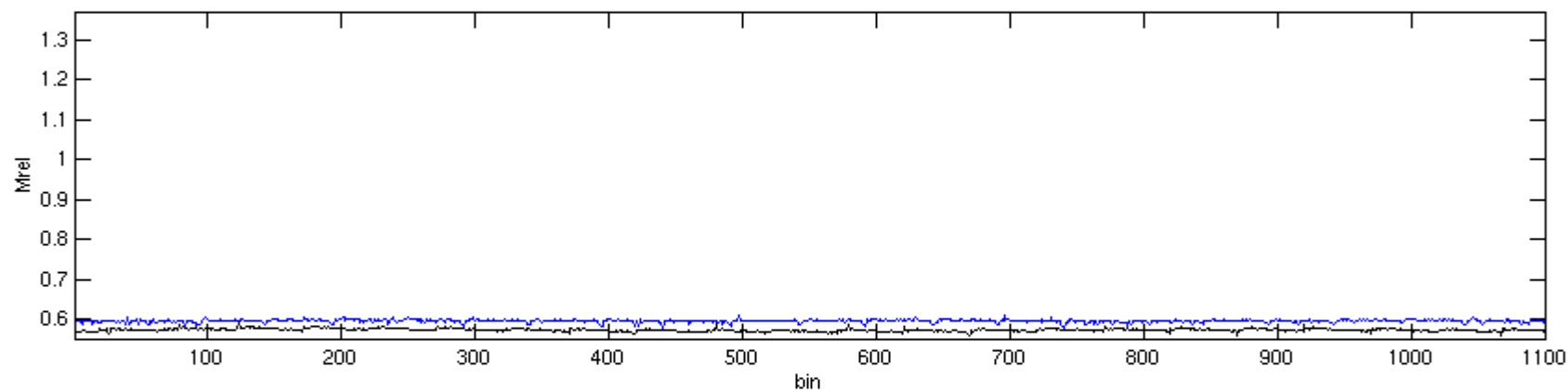
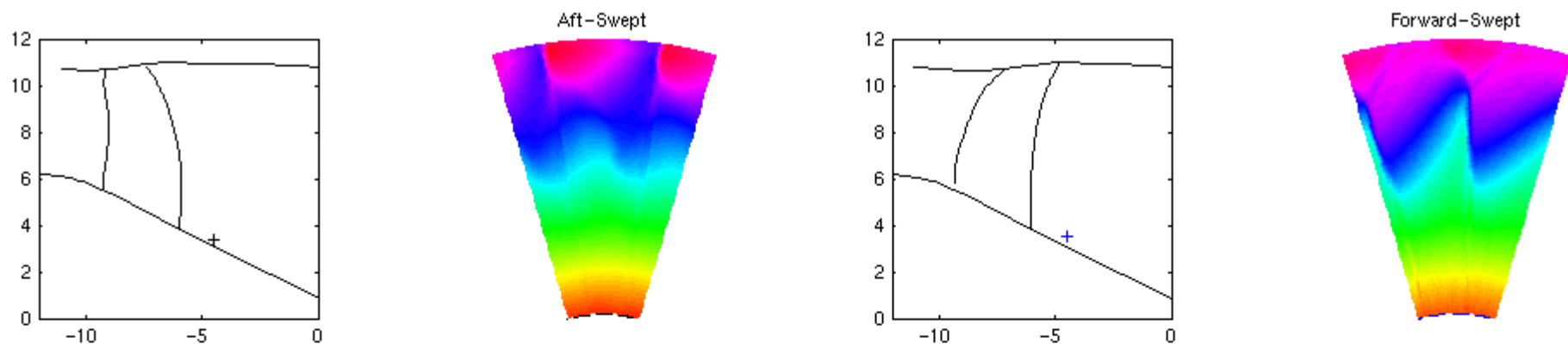


Figure 33.—Comparison of the disturbances measured upstream of the aft-swept and forward-swept fans. These data were measured at axial station 1 with the rotors operating at the high-speed condition.

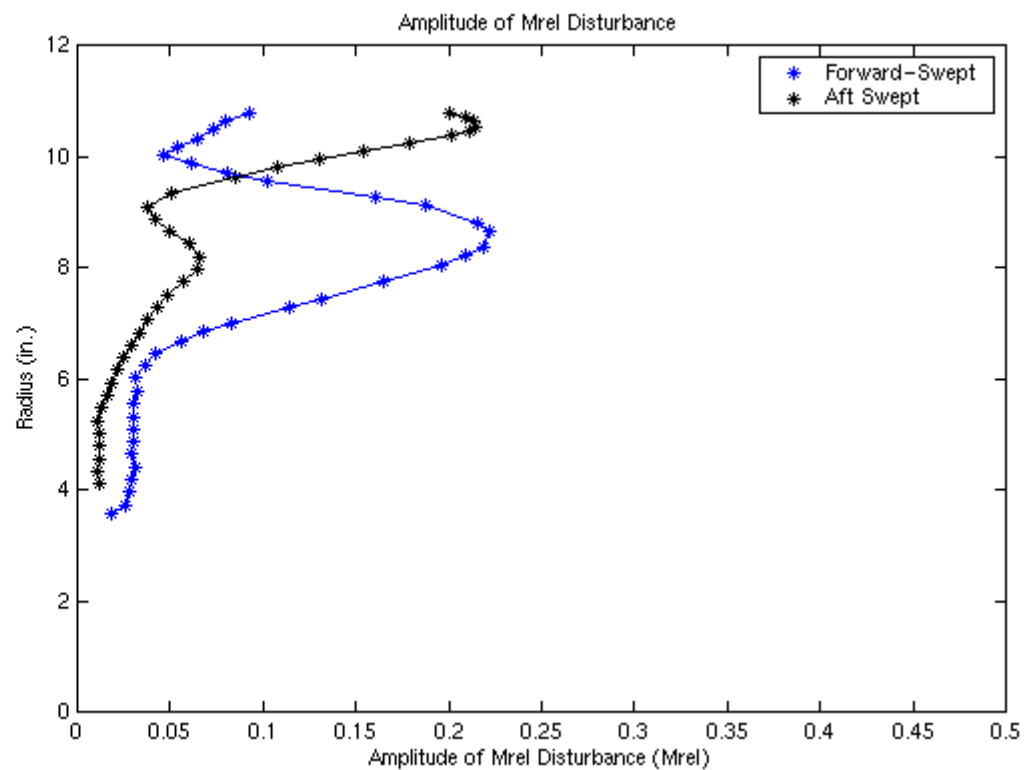
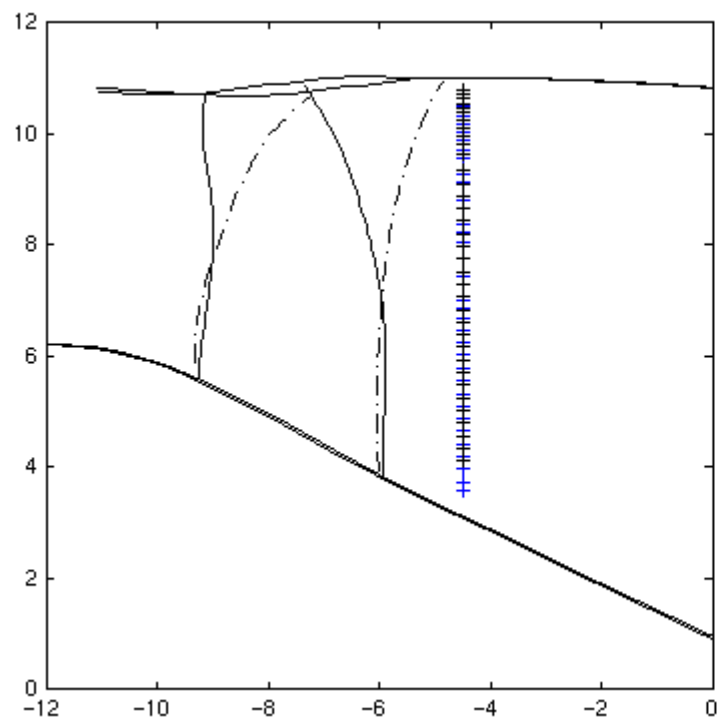
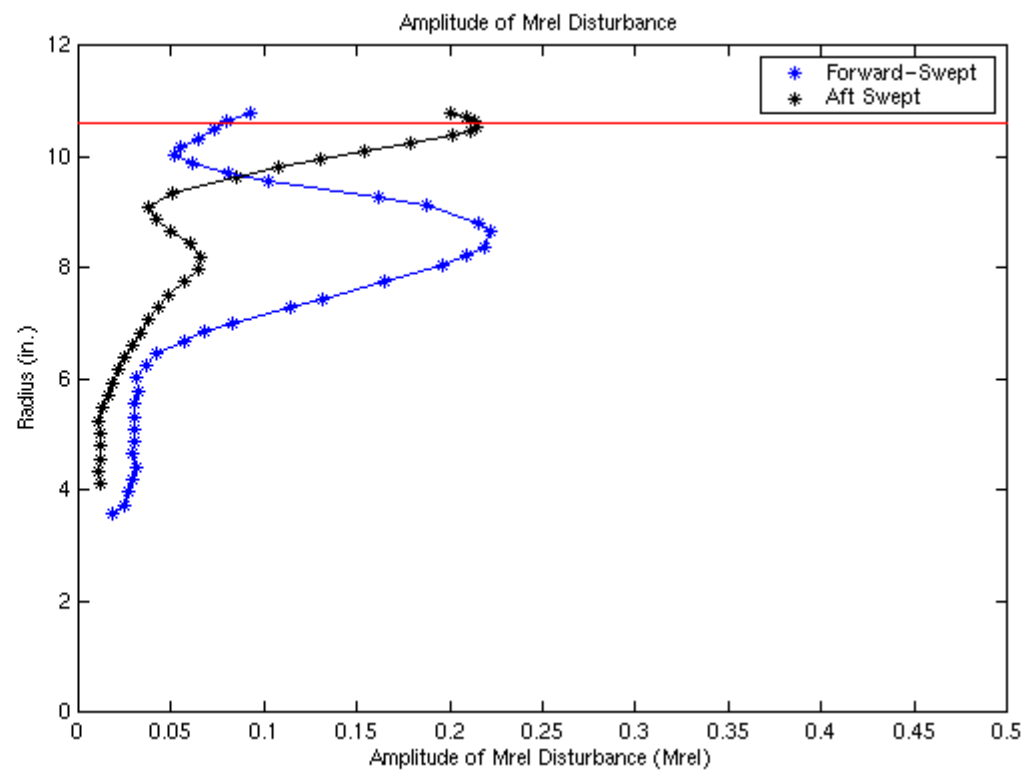
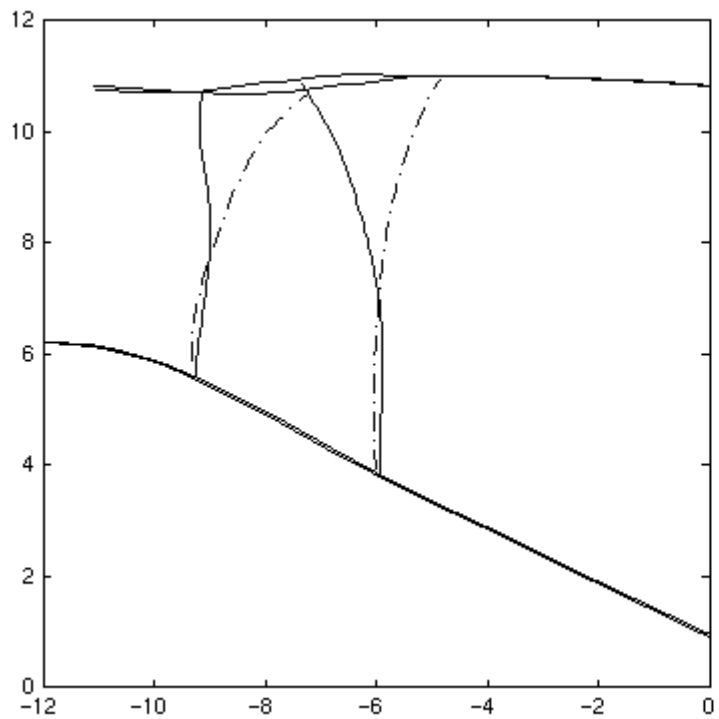
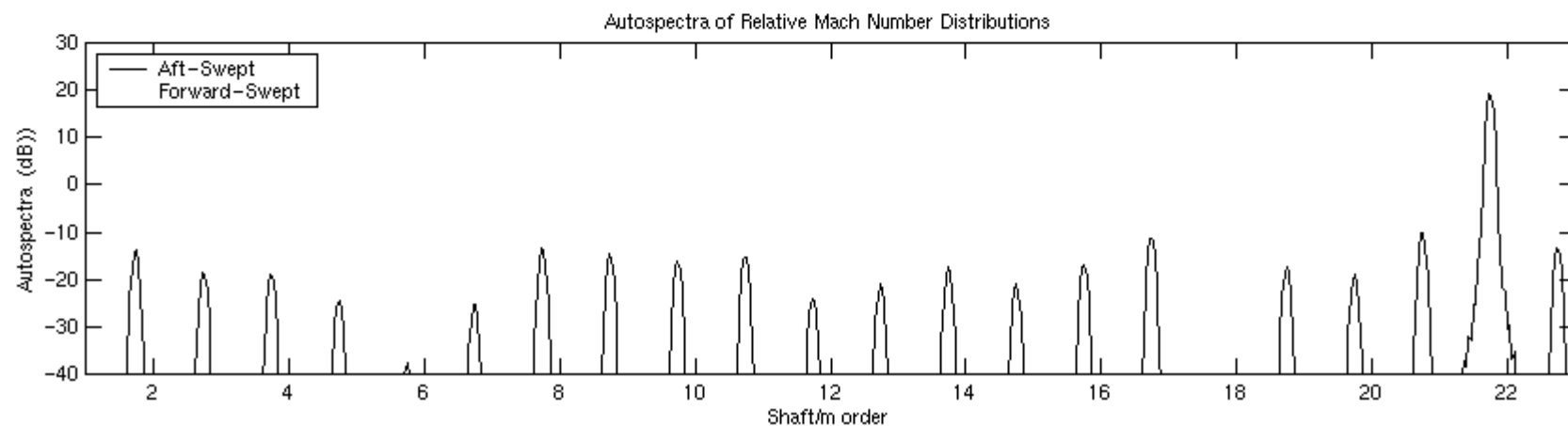
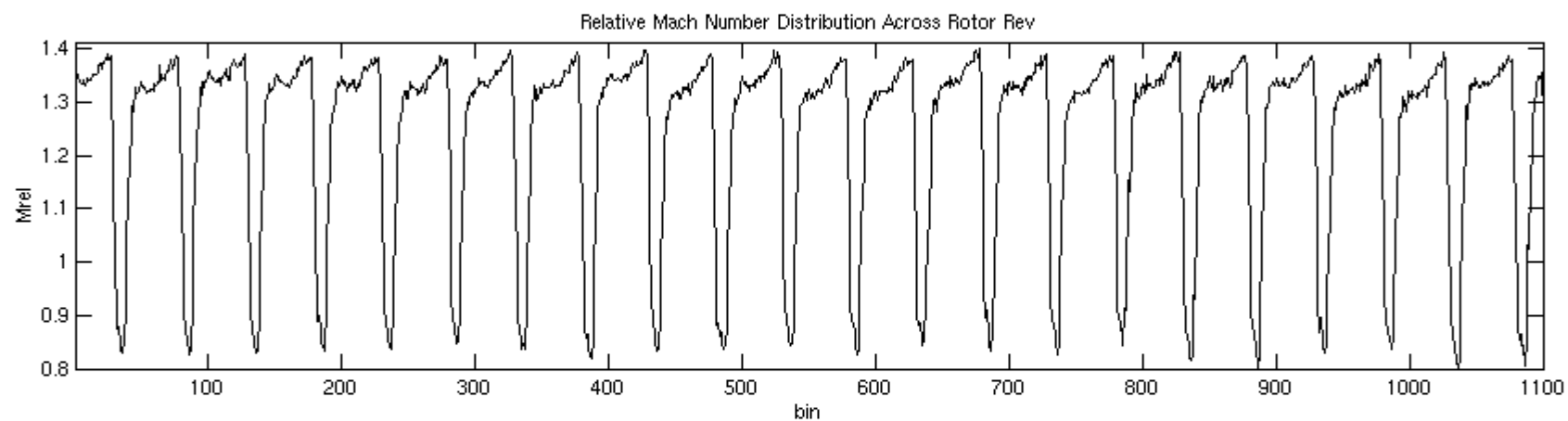
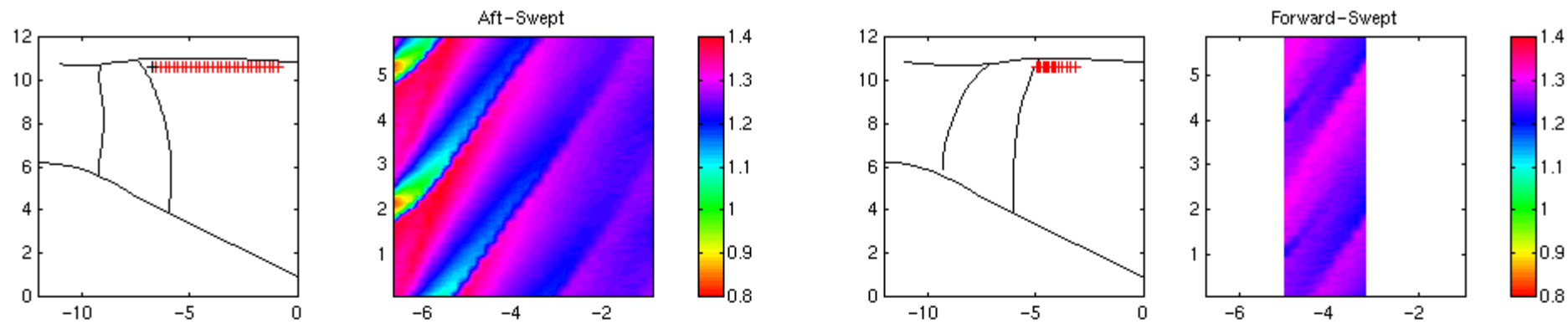
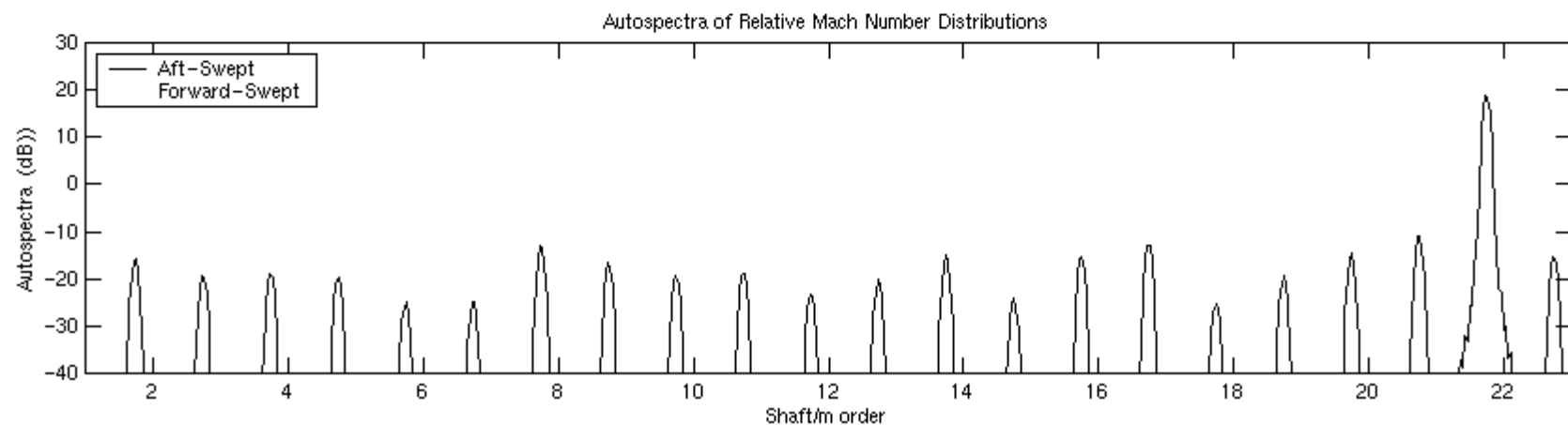
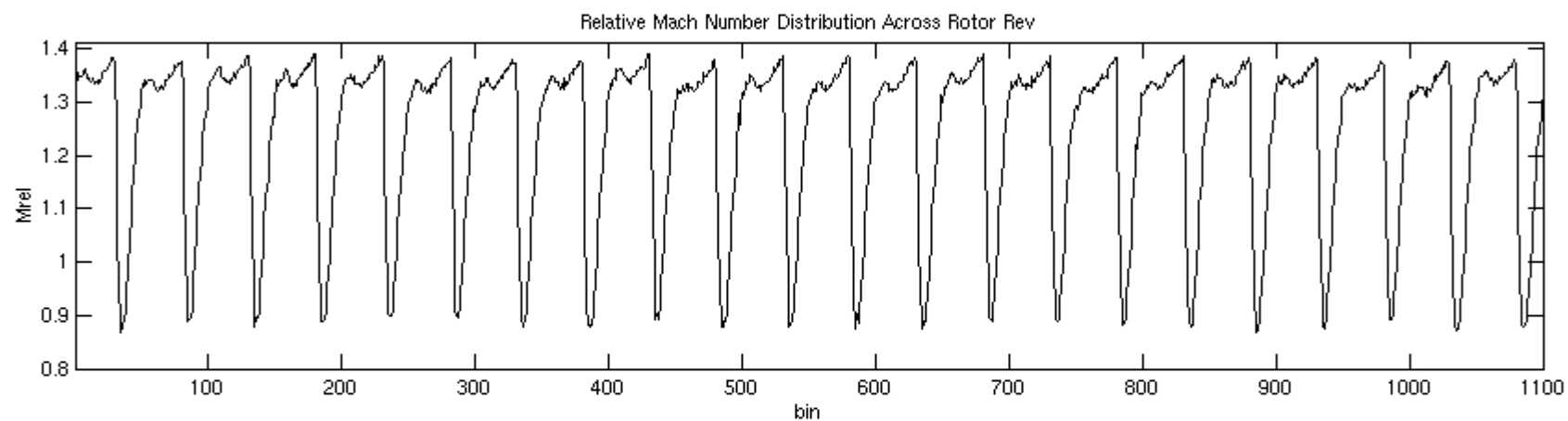
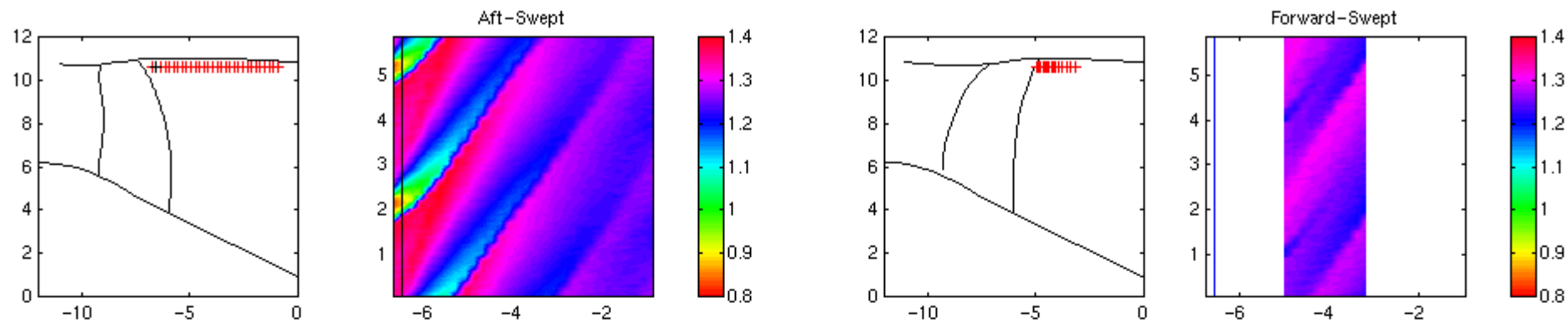
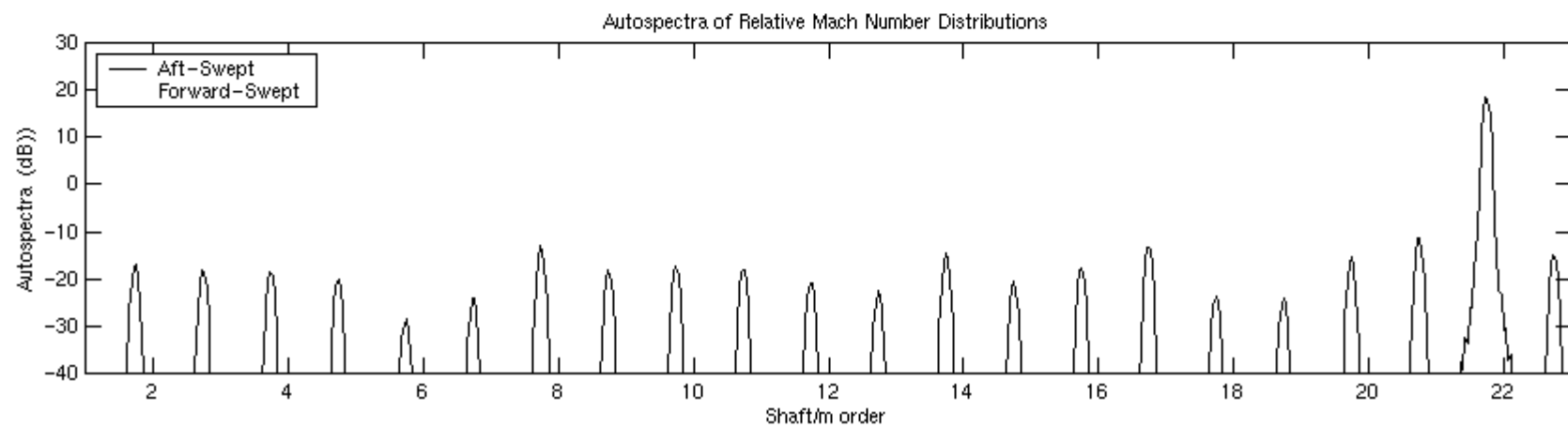
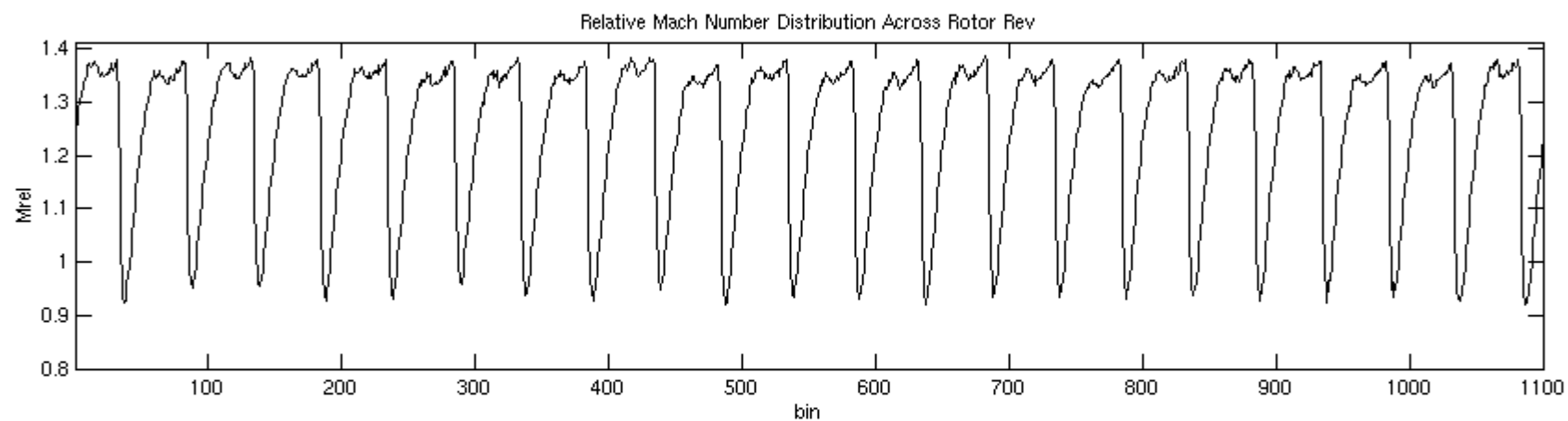
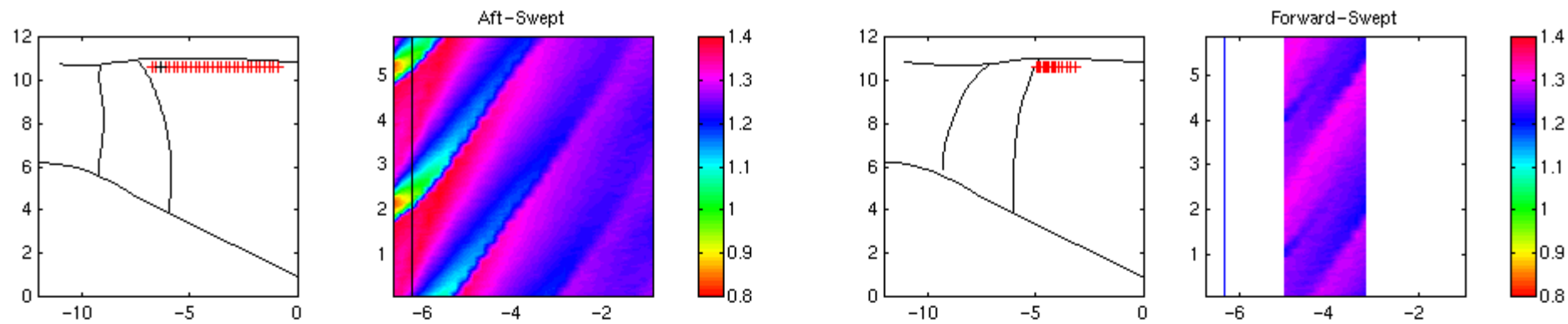


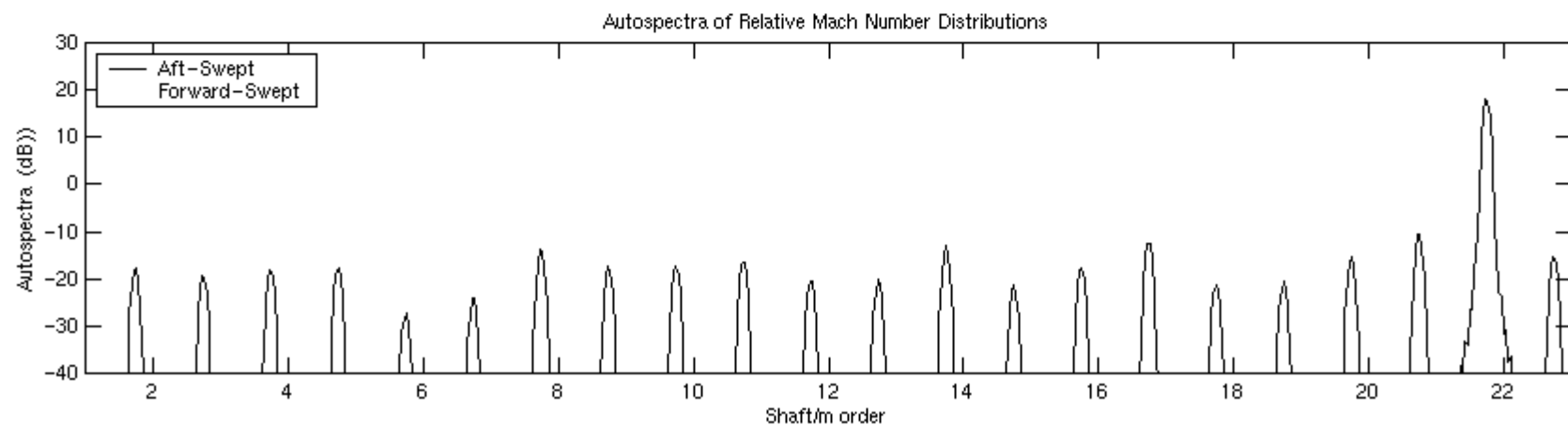
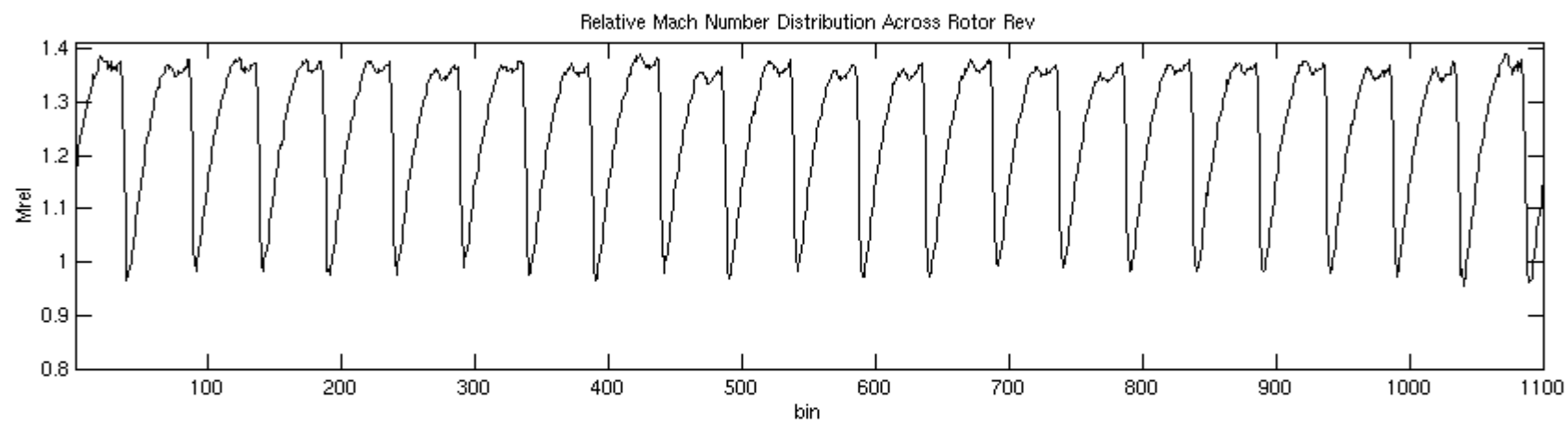
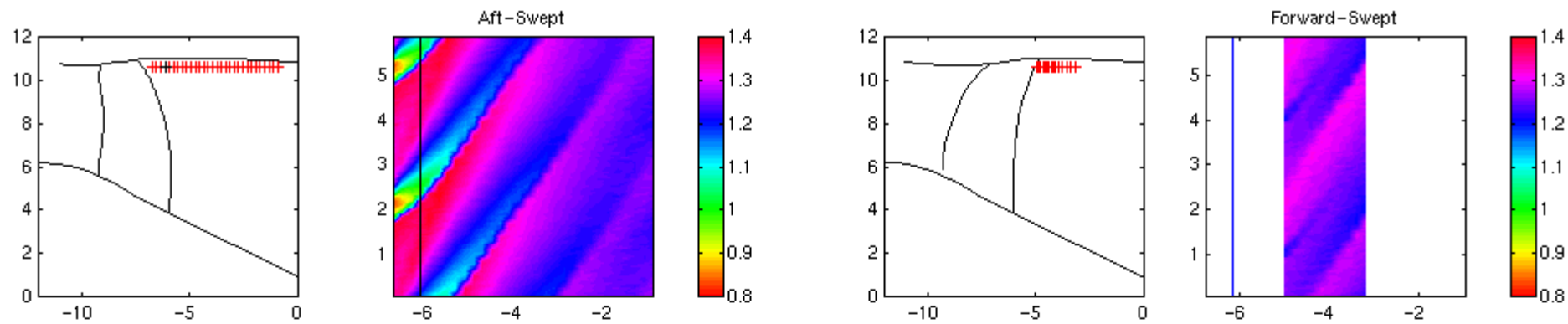
Figure 34.—Slideshow (31 slides) comparing the flows measured upstream of the aft-swept and forward-swept fans at $r = 10.6$ in. with both rotors at the high-speed condition. The first slide in the sequence illustrates where the data presented in the succeeding slides was obtained.

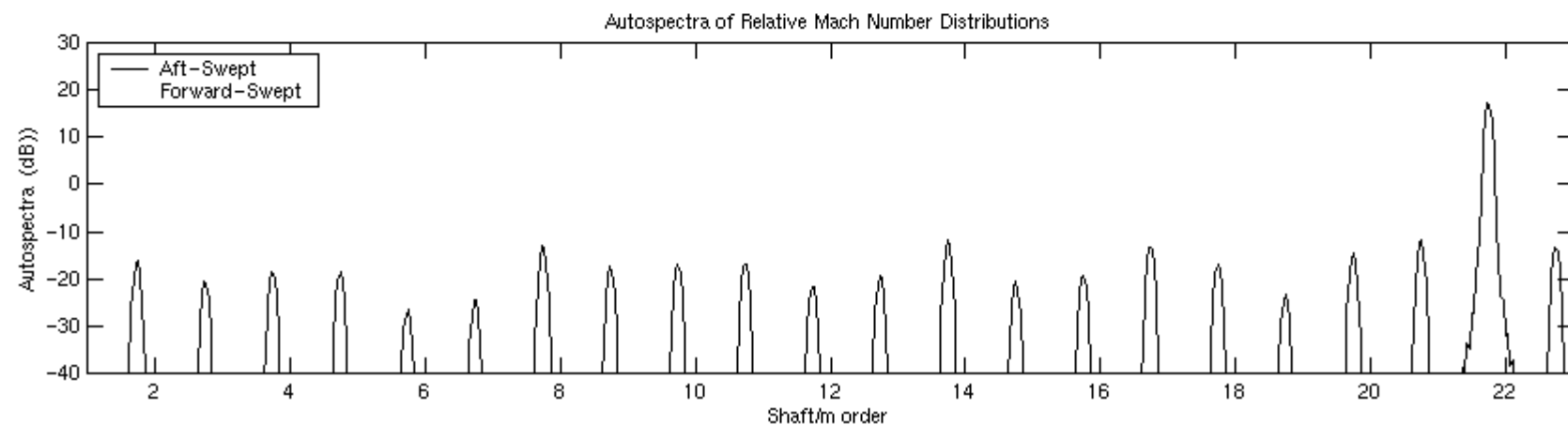
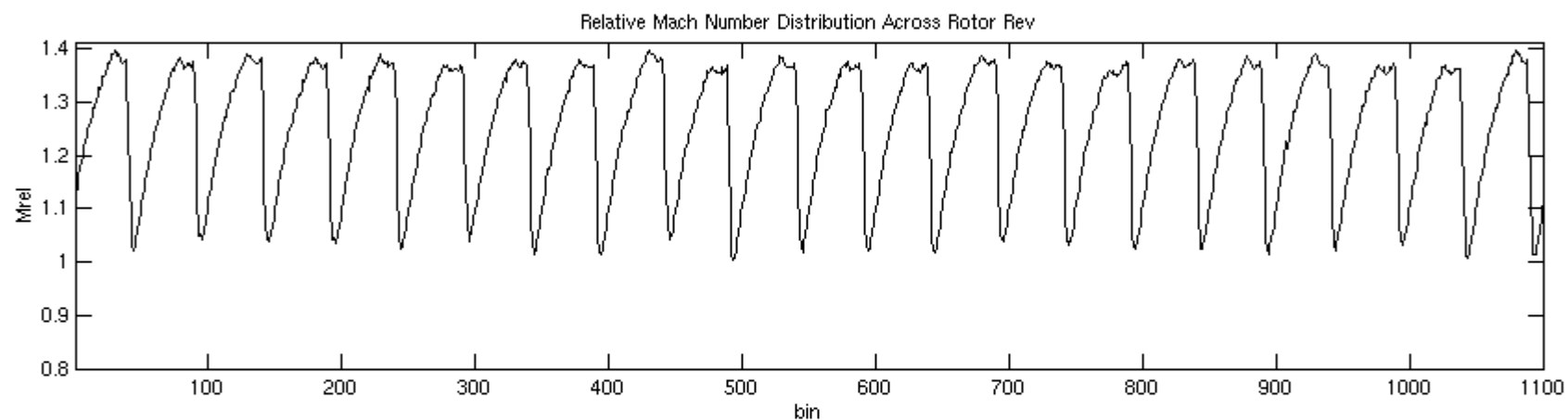
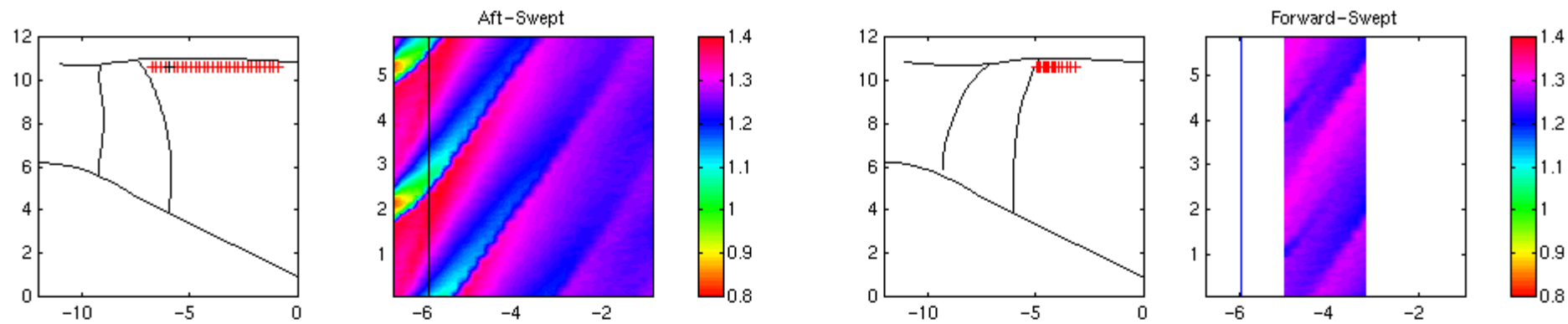


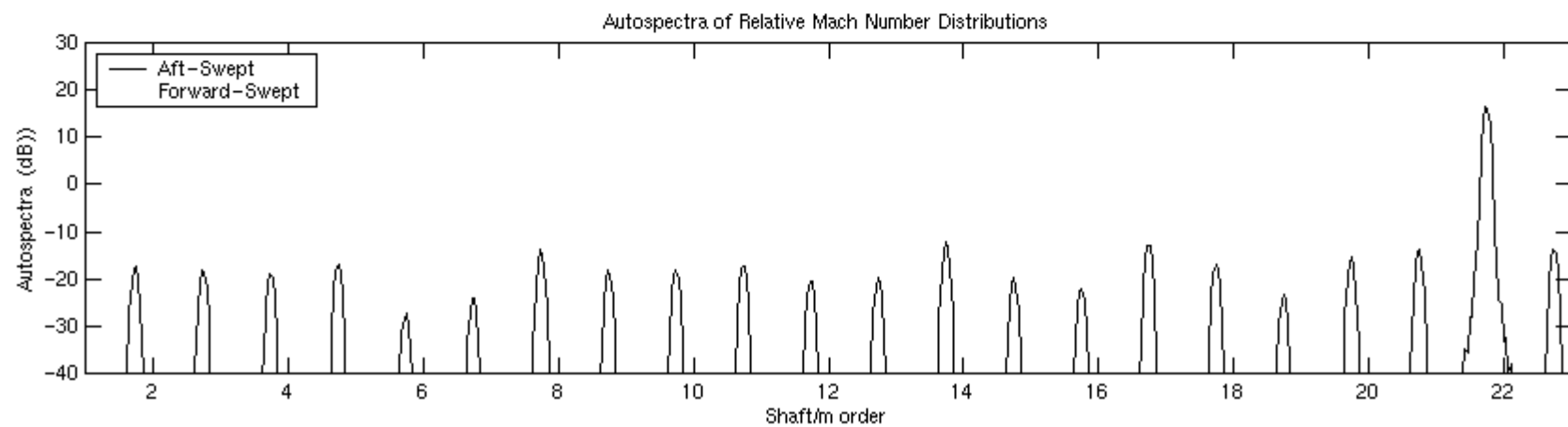
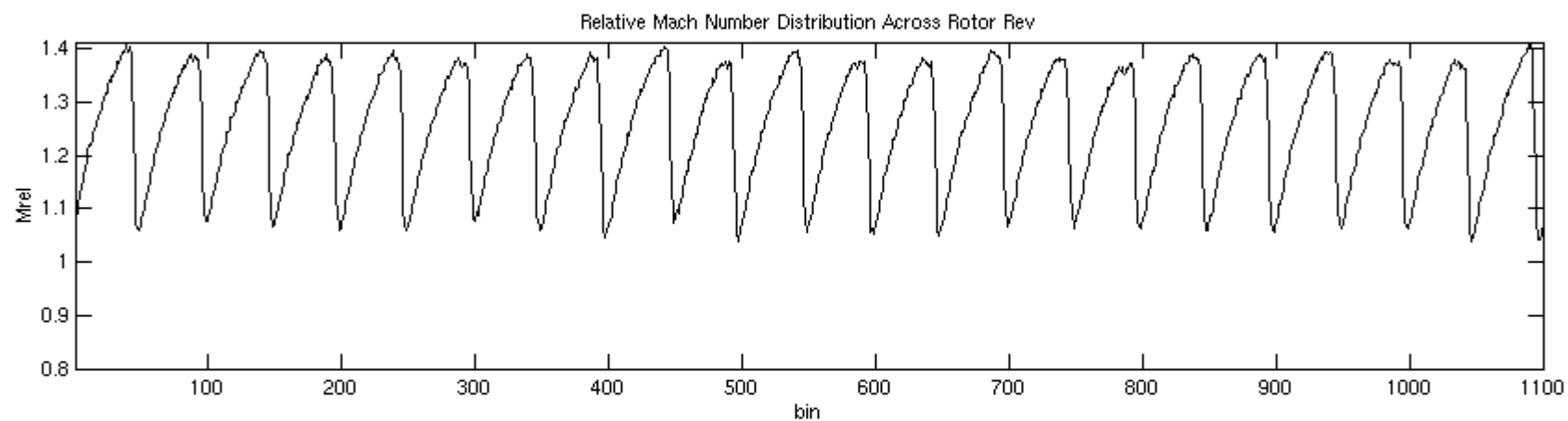
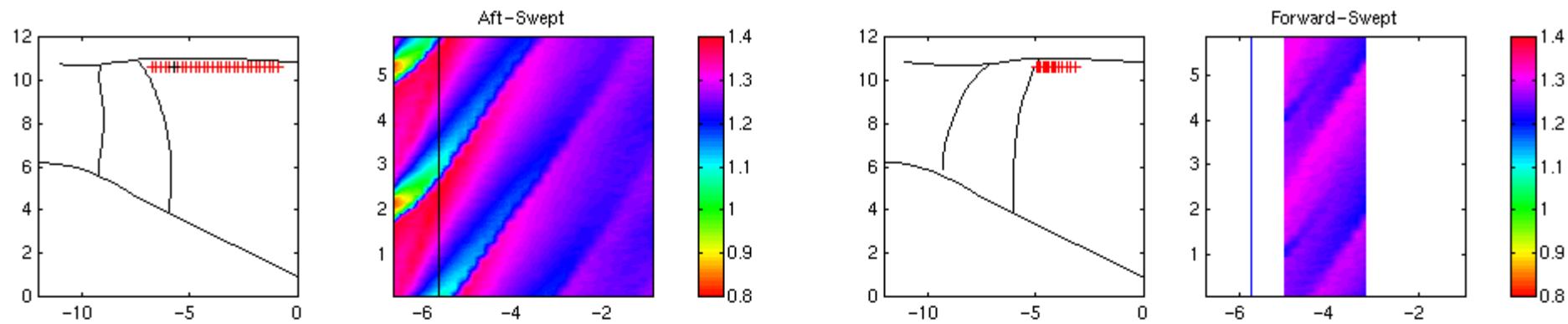


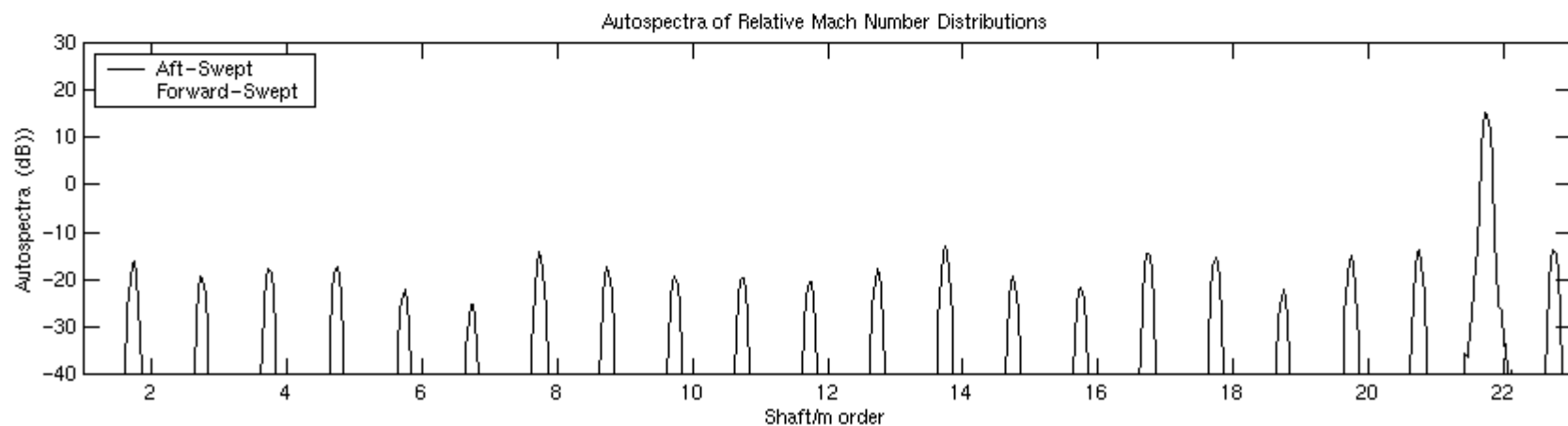
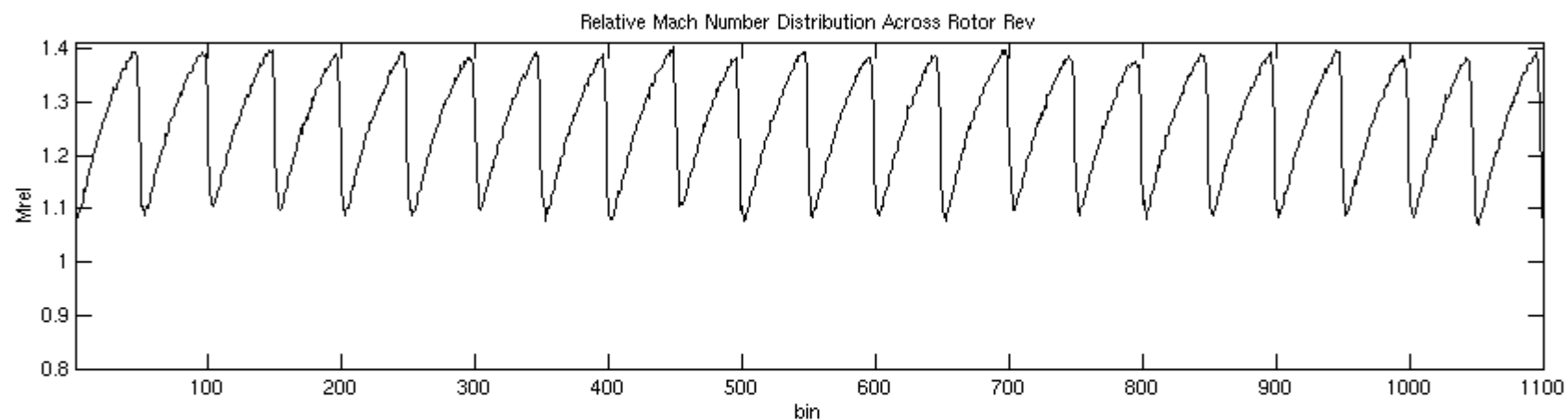
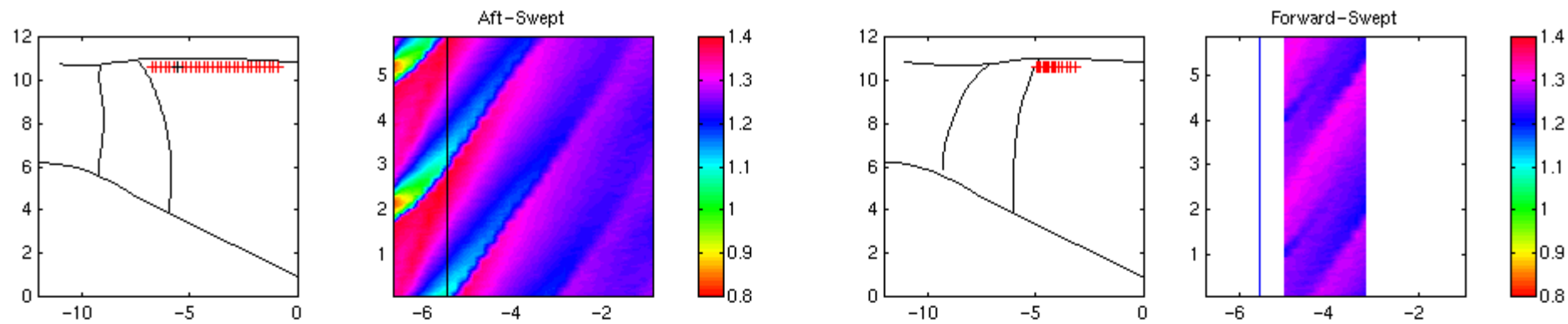


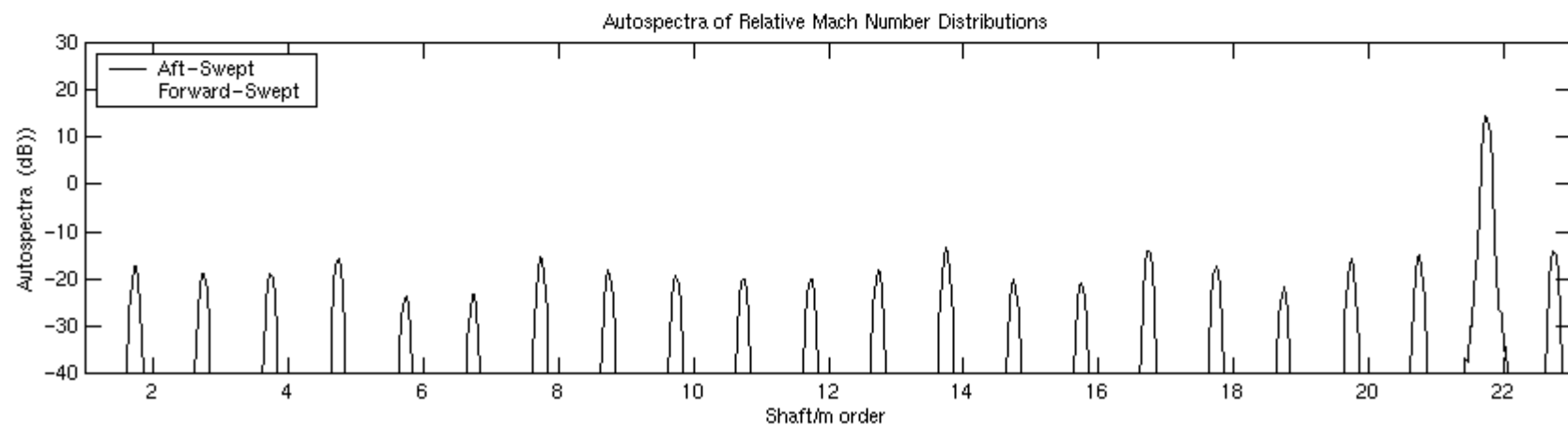
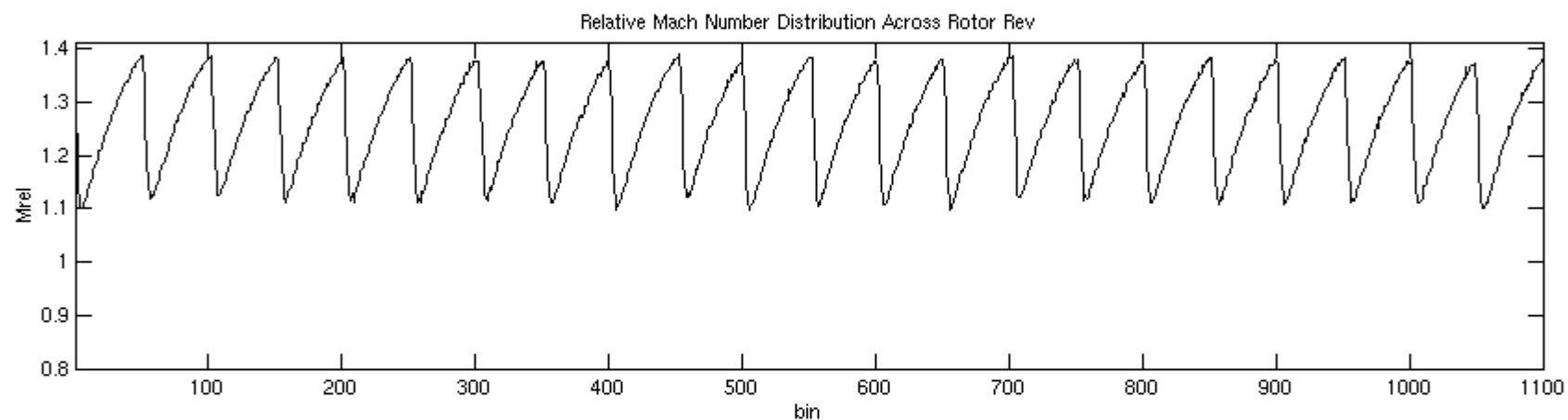
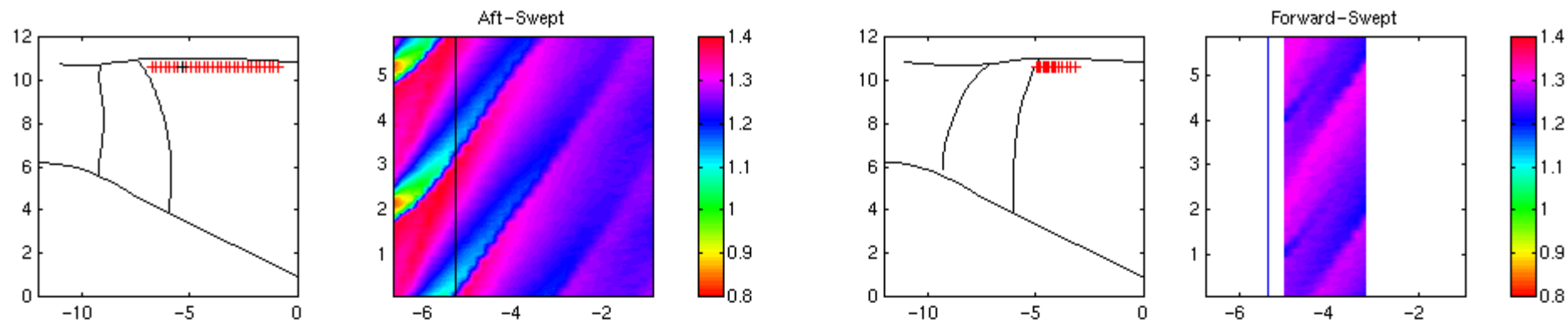


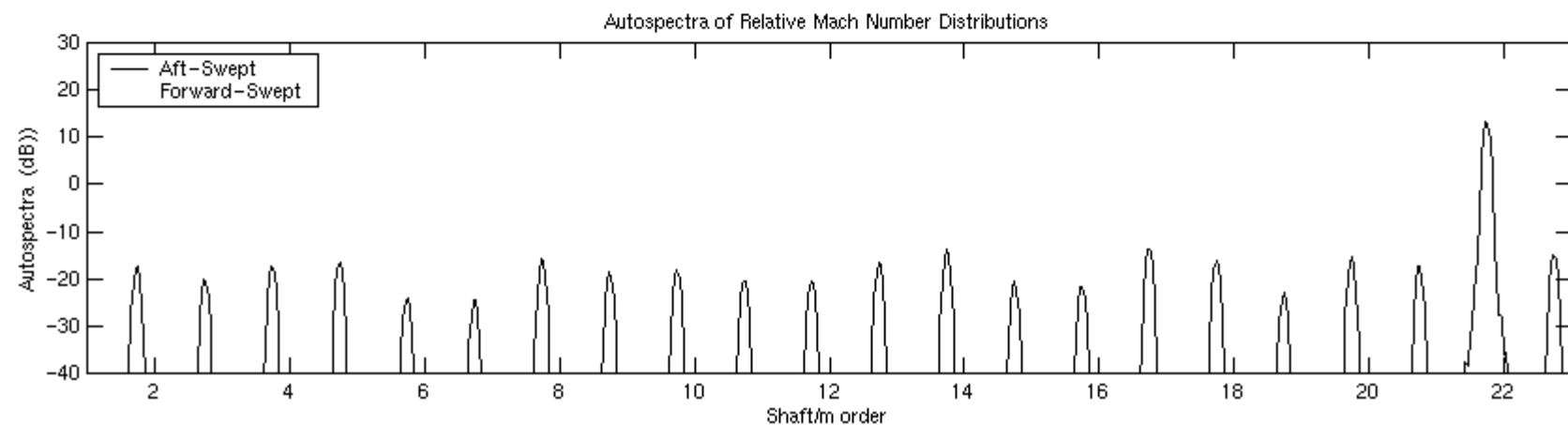
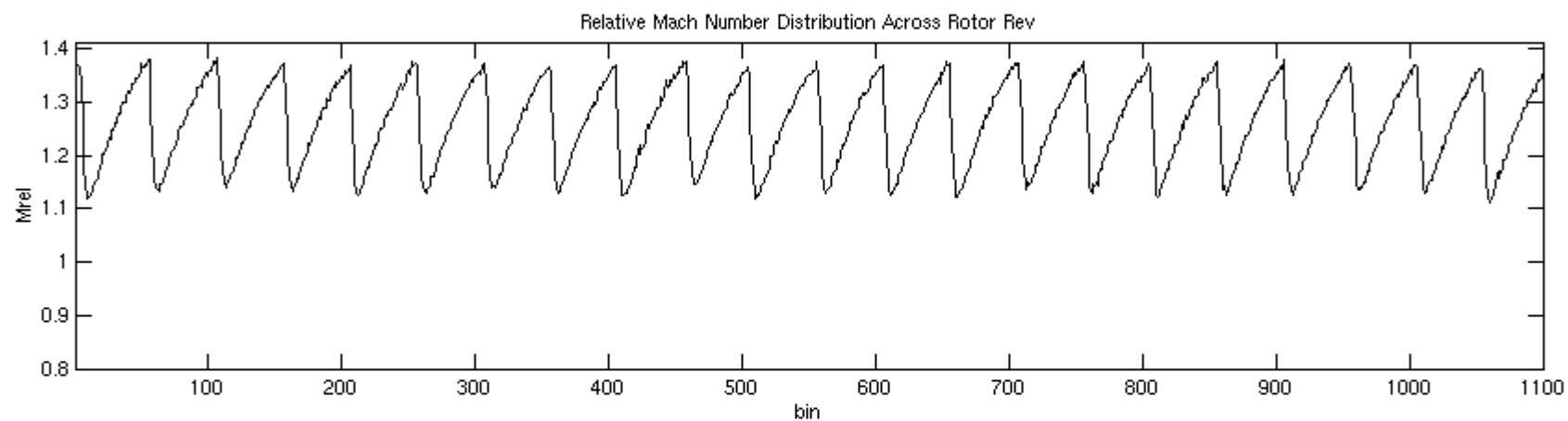
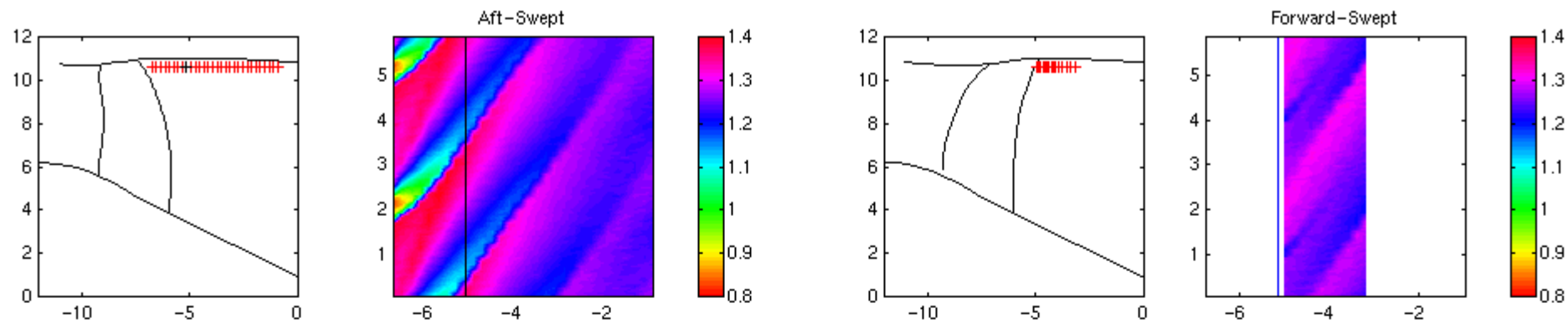


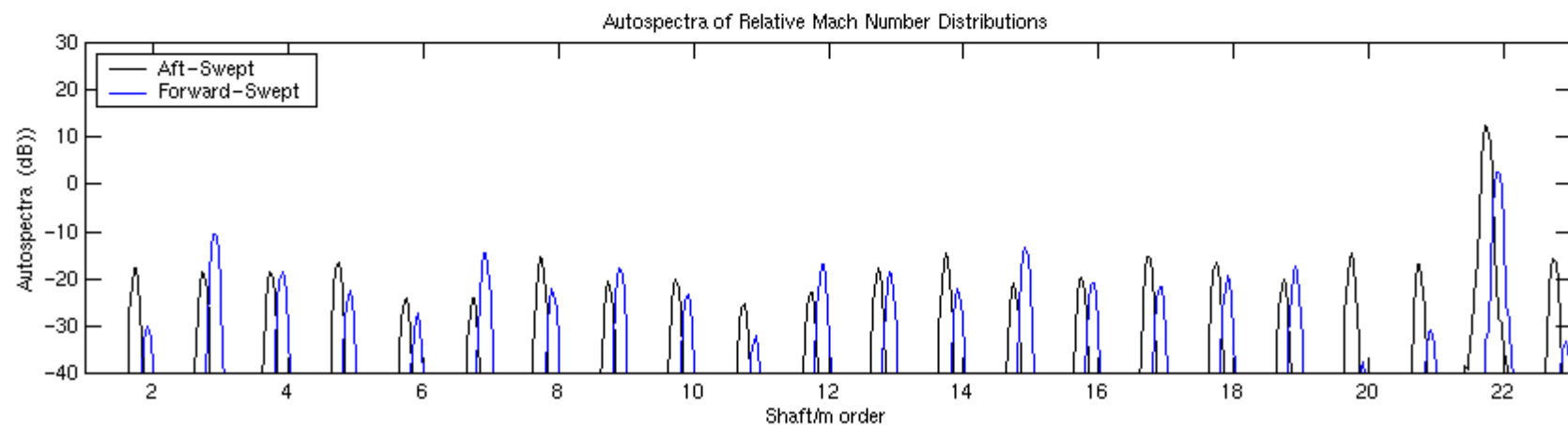
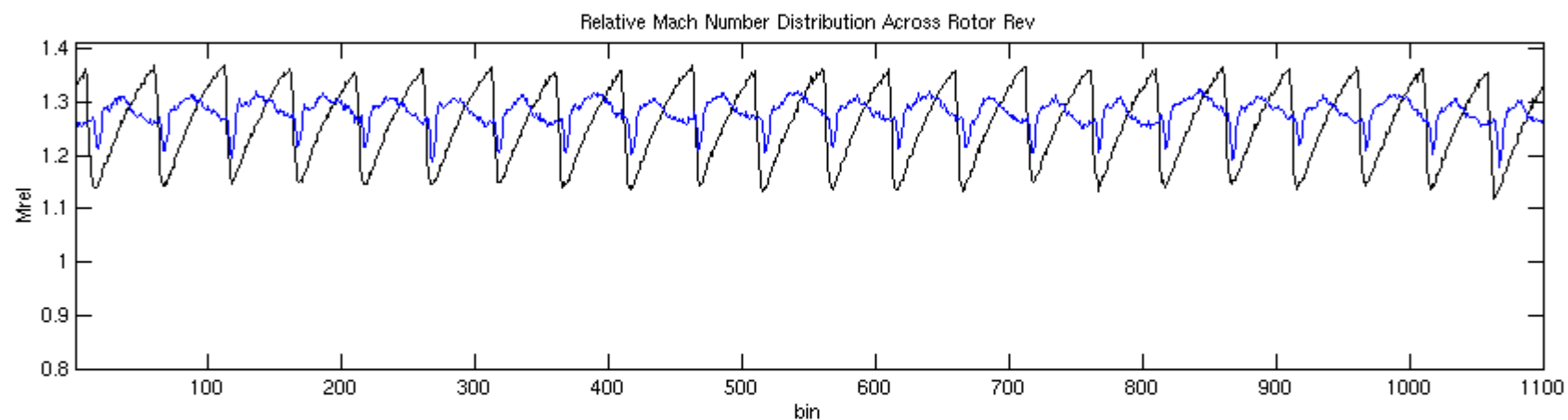
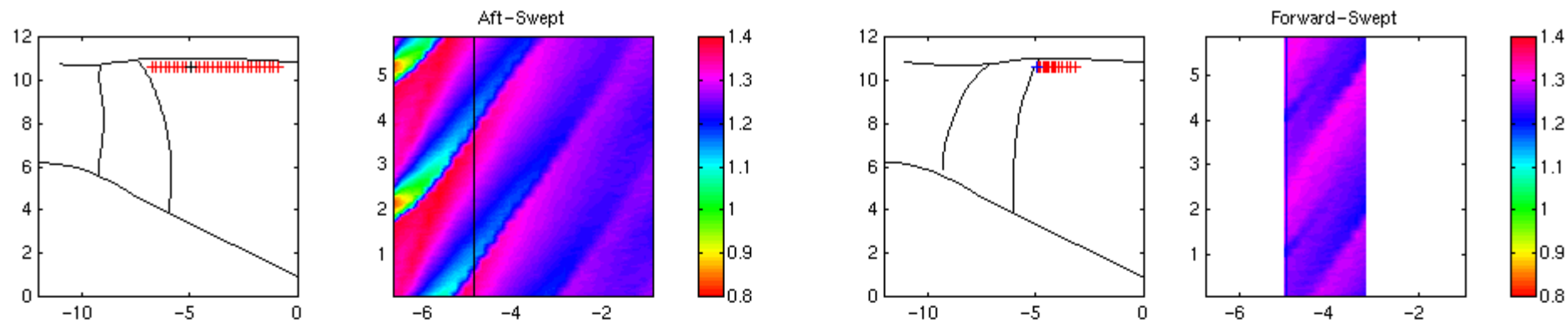


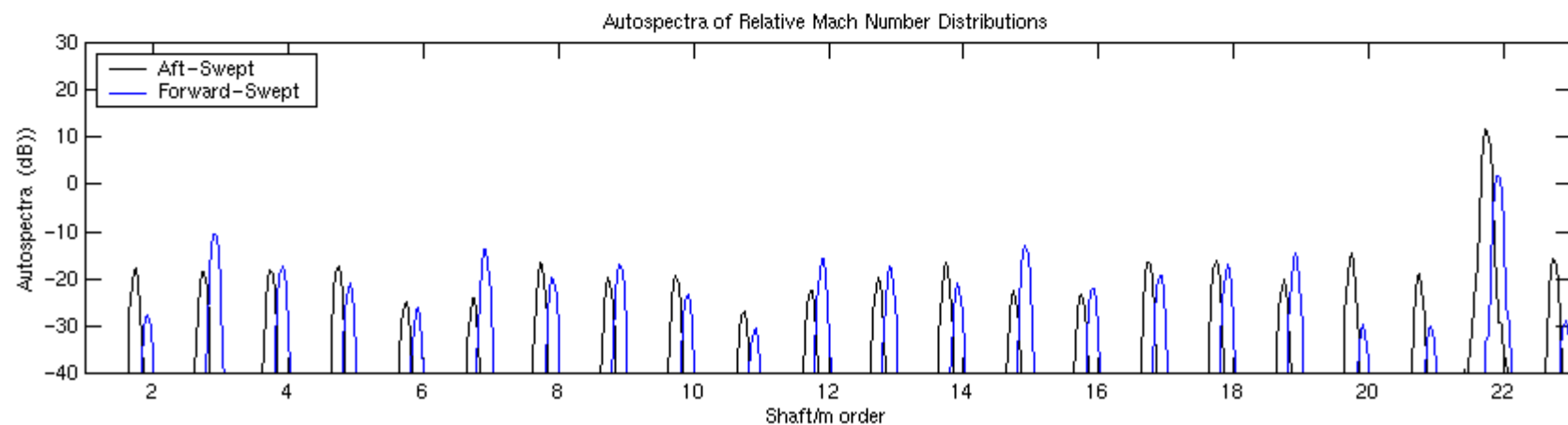
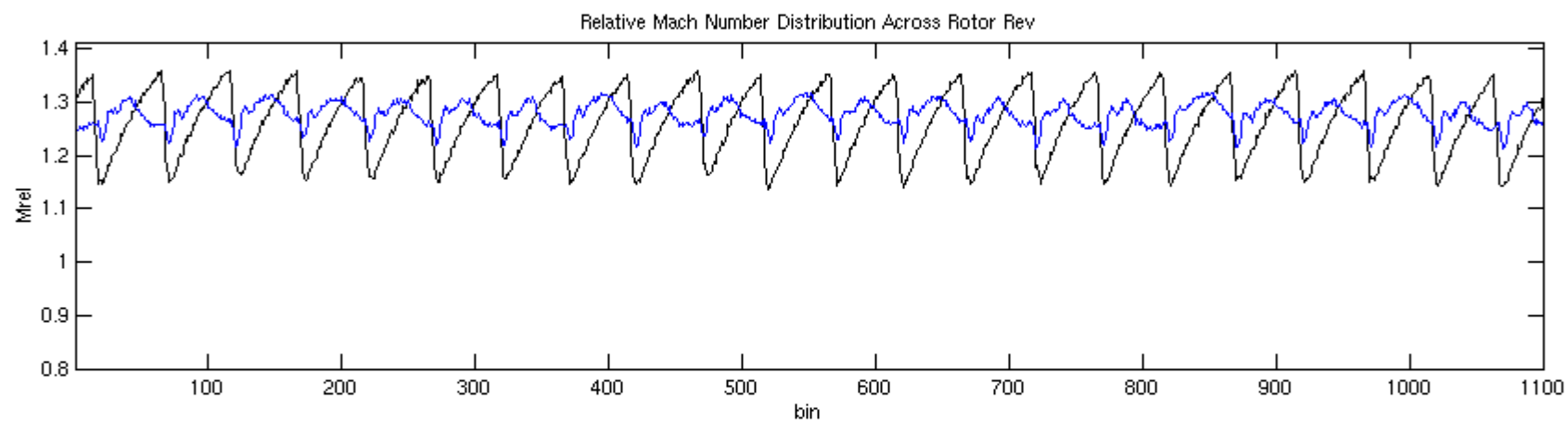
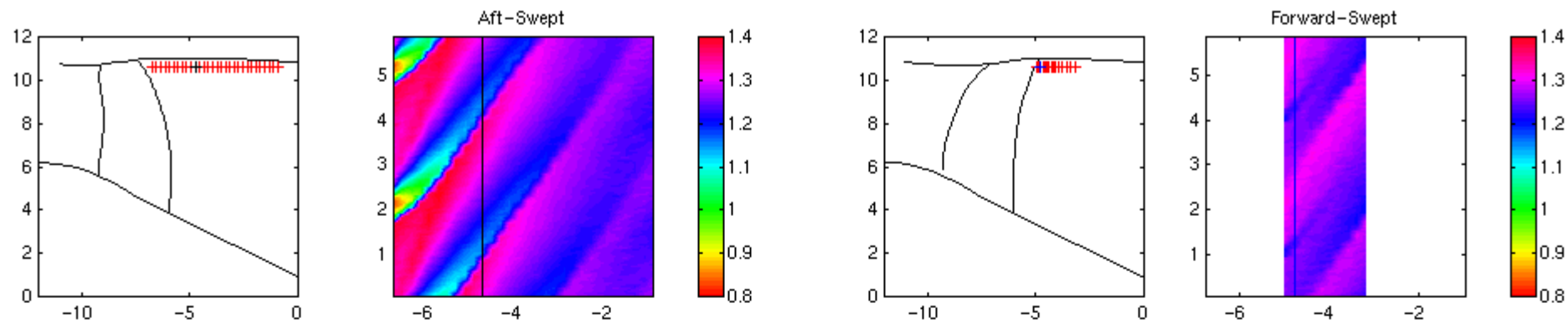


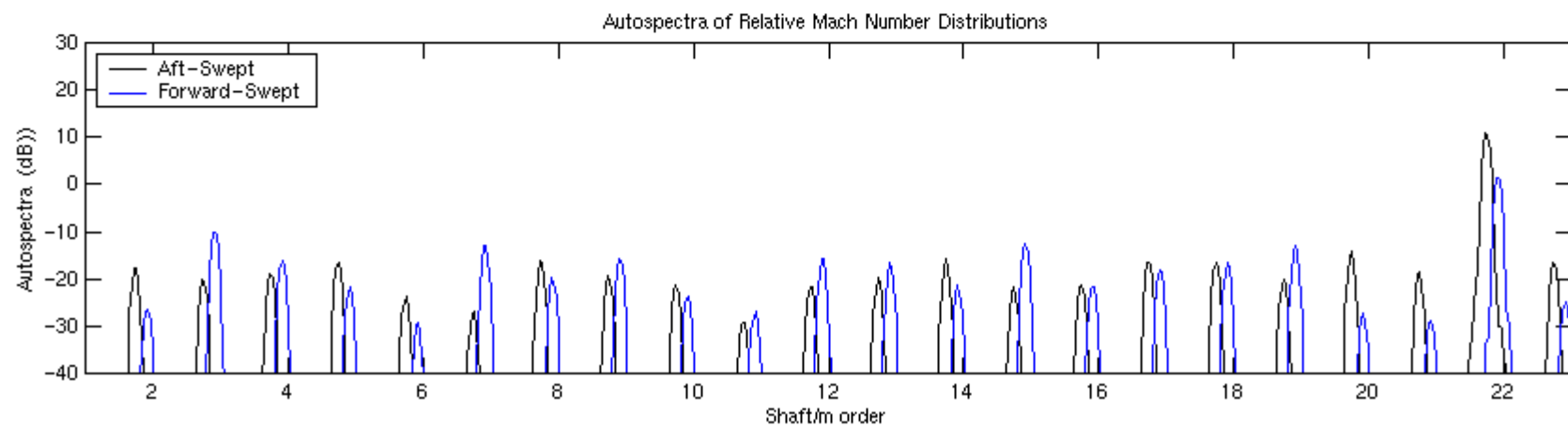
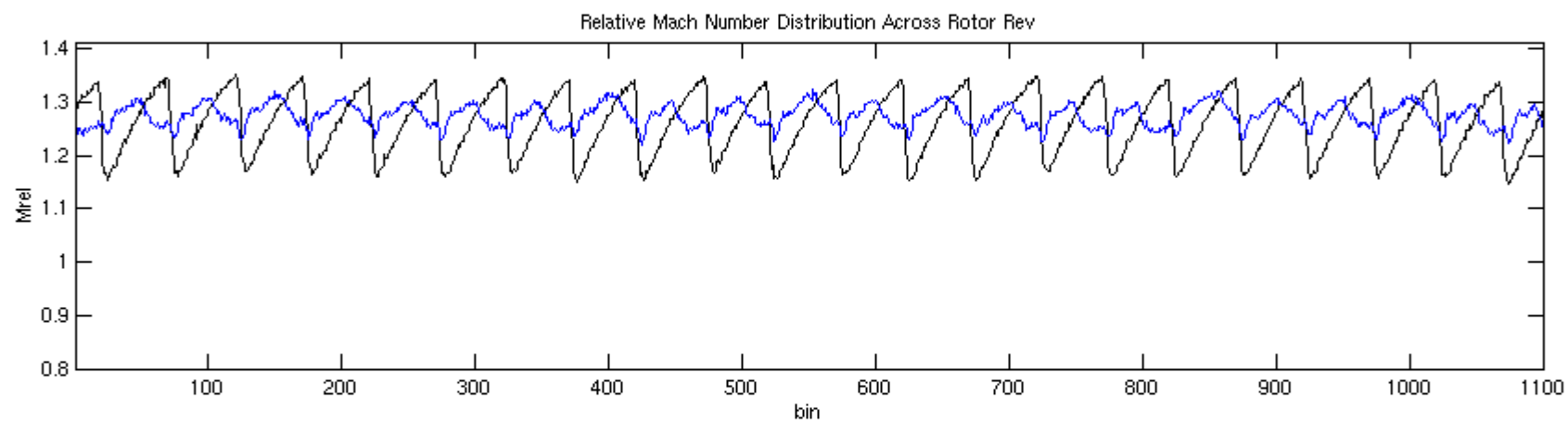
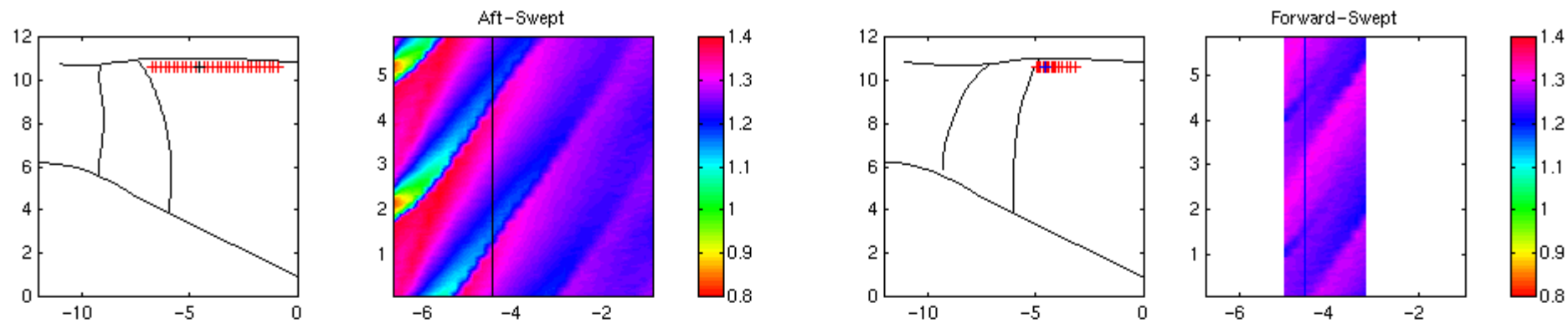


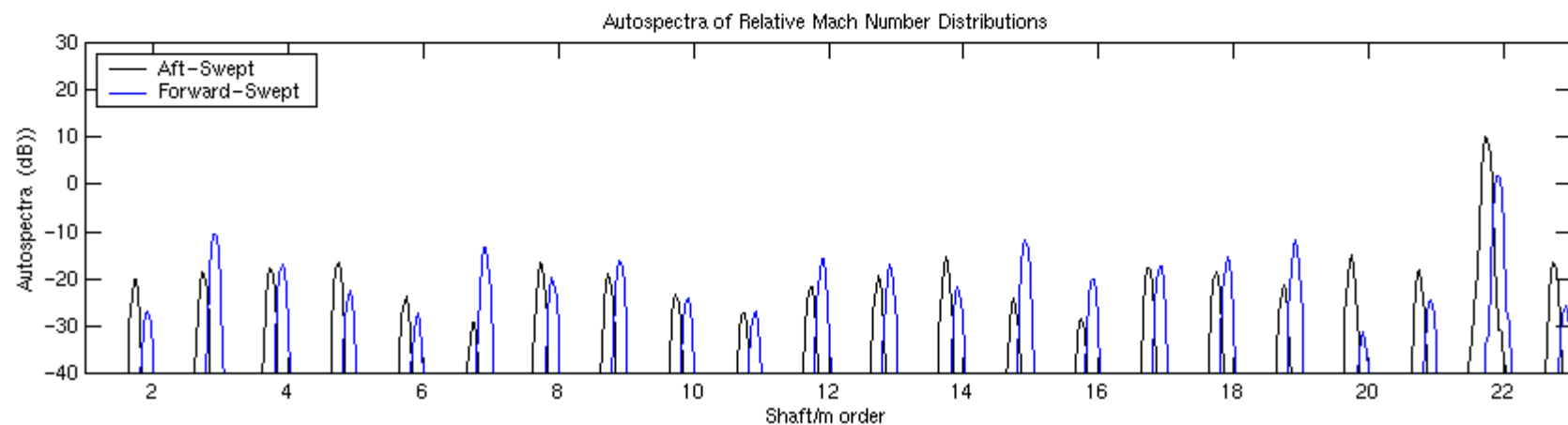
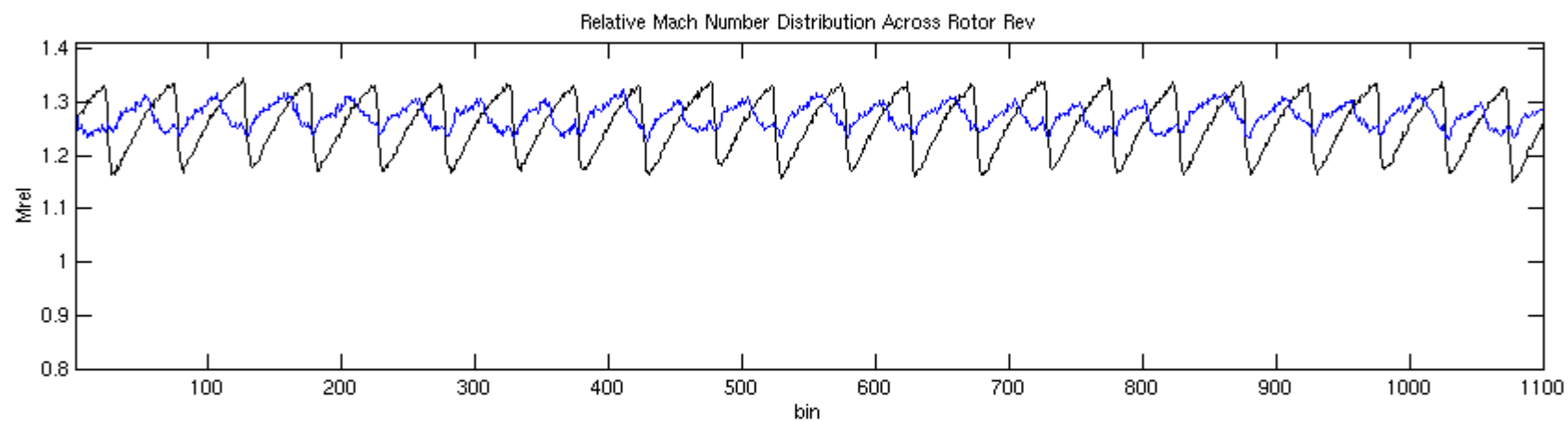
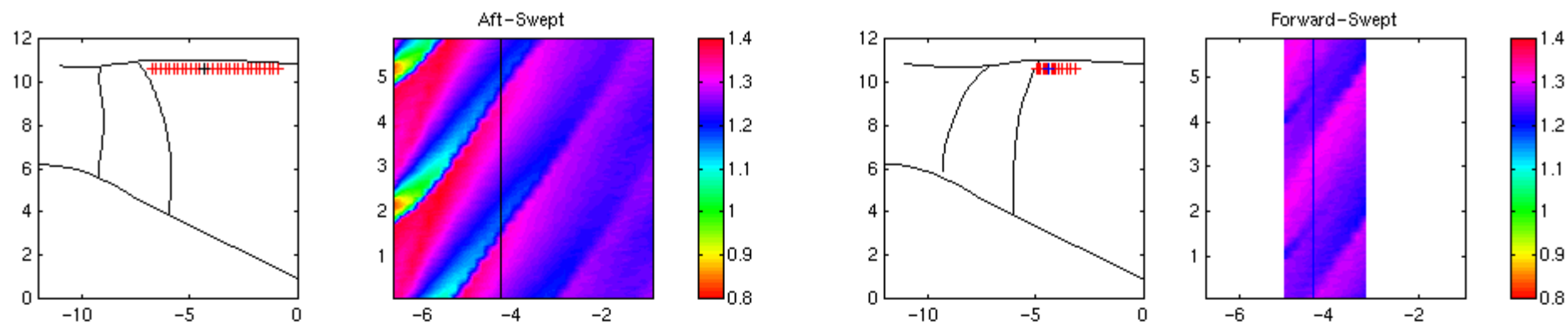


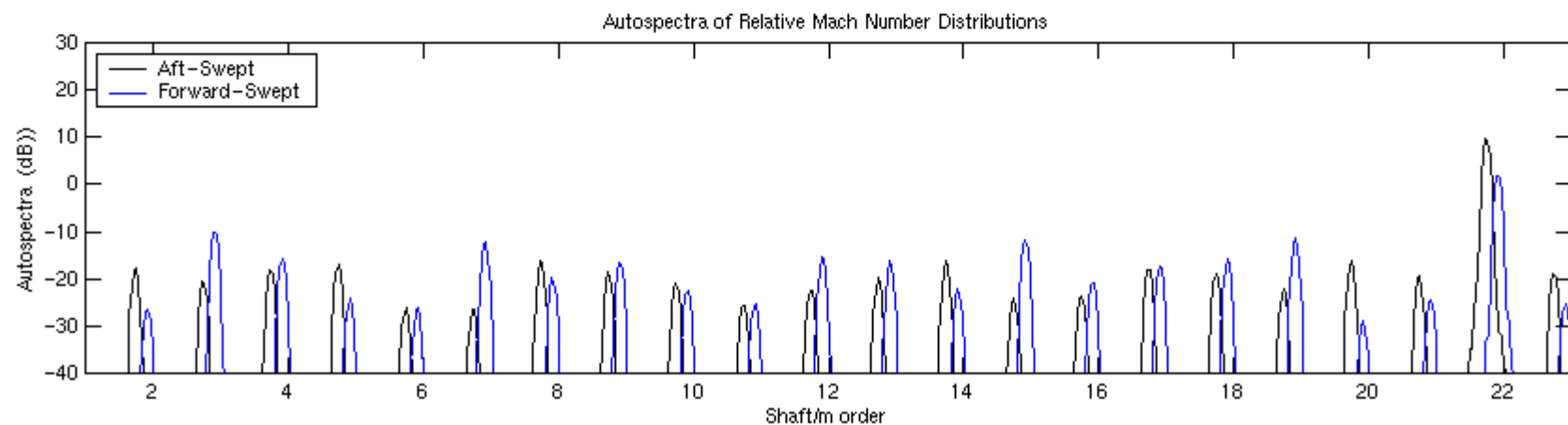
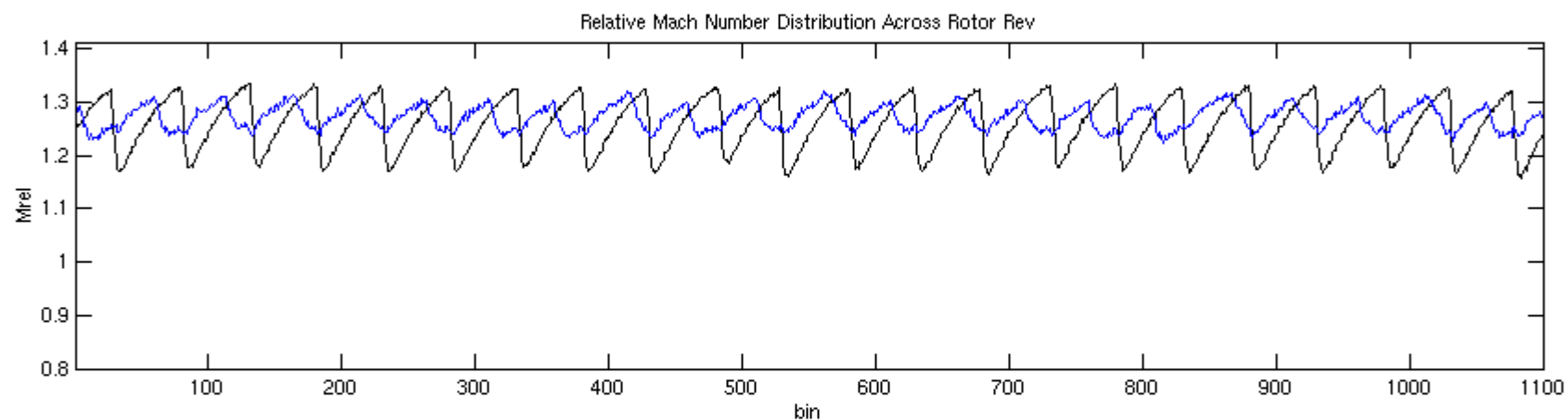
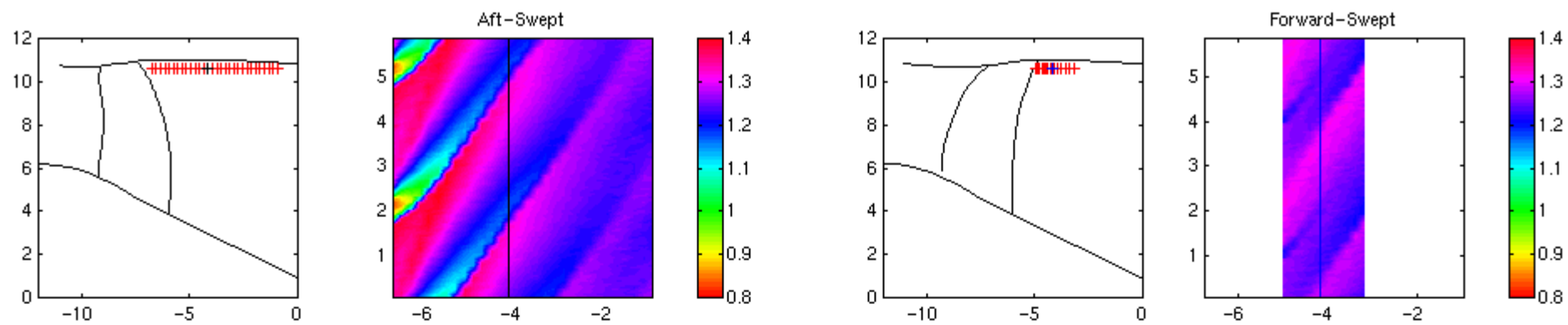


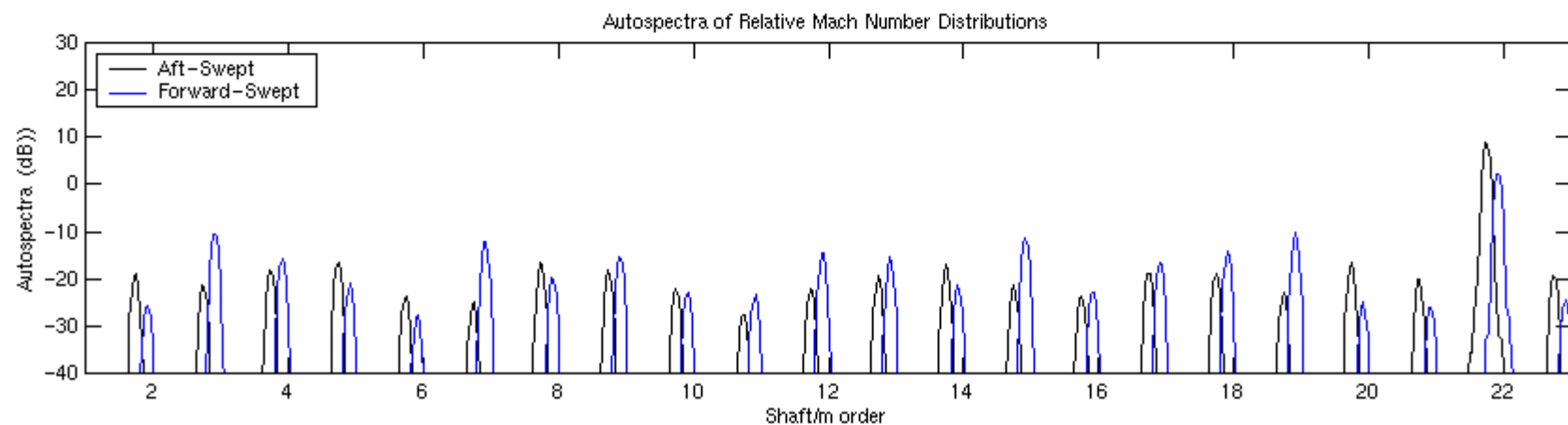
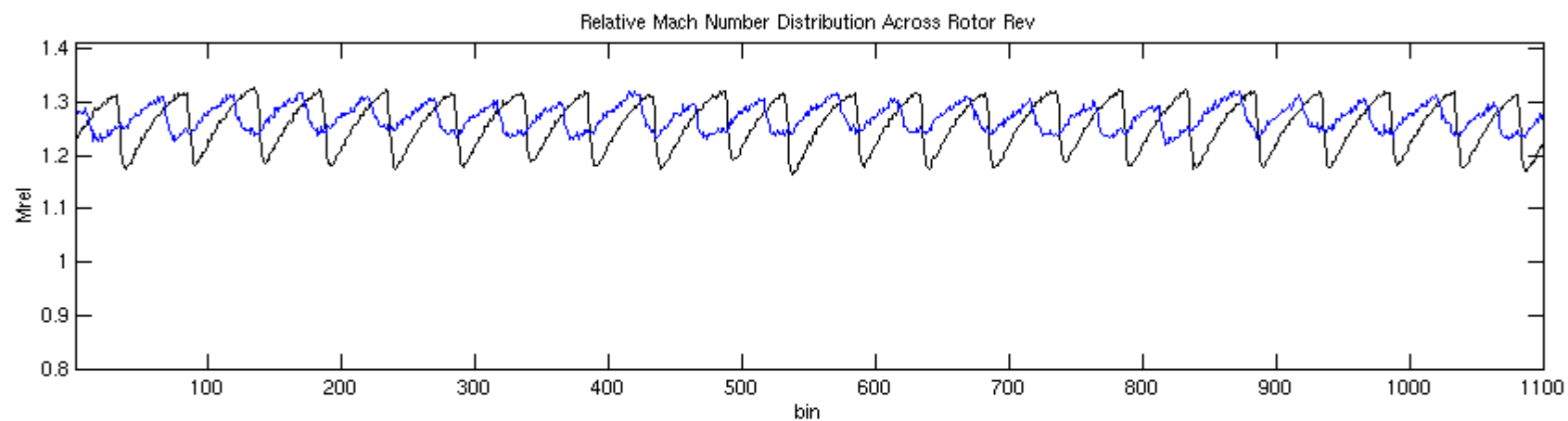
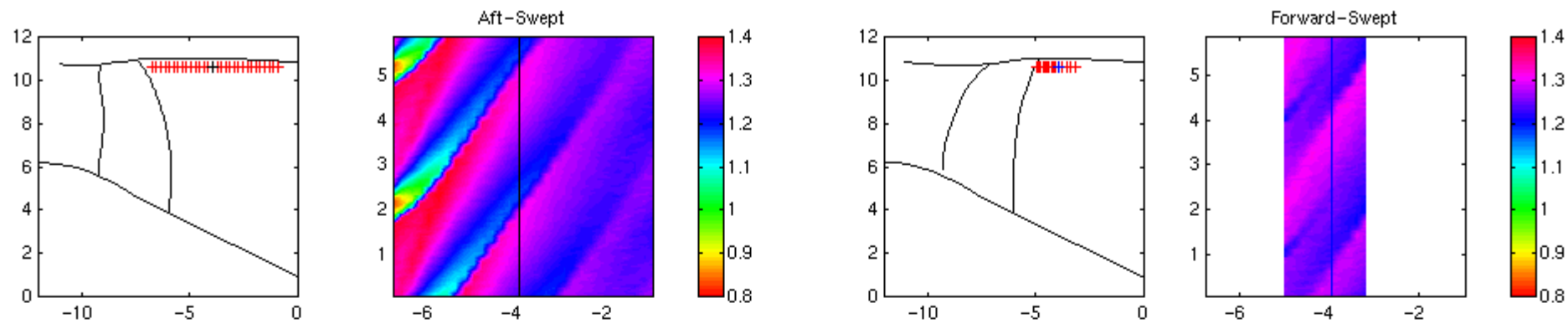


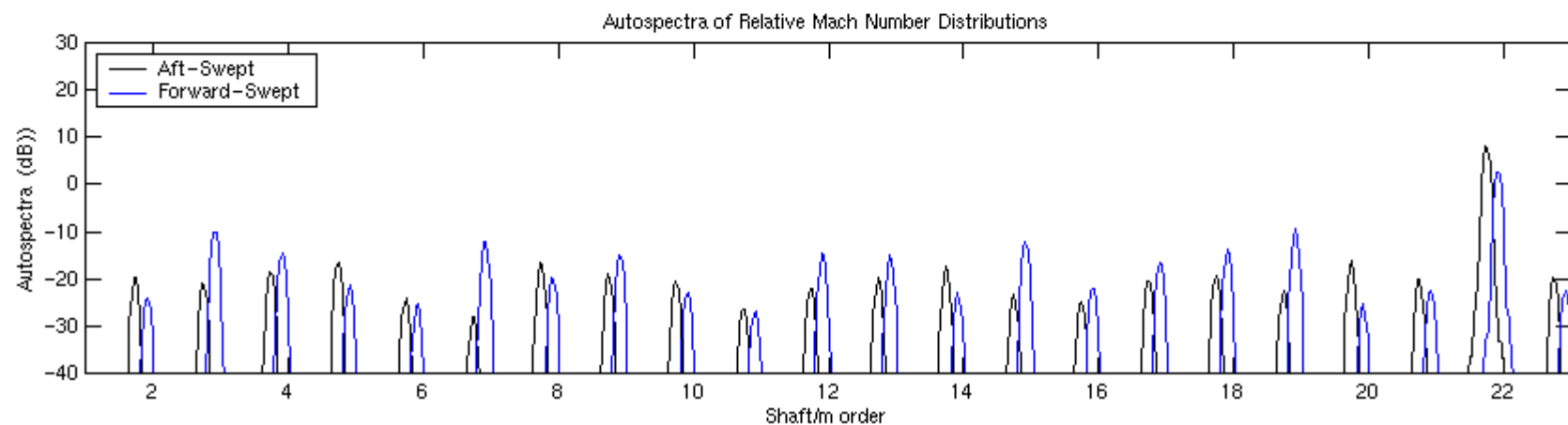
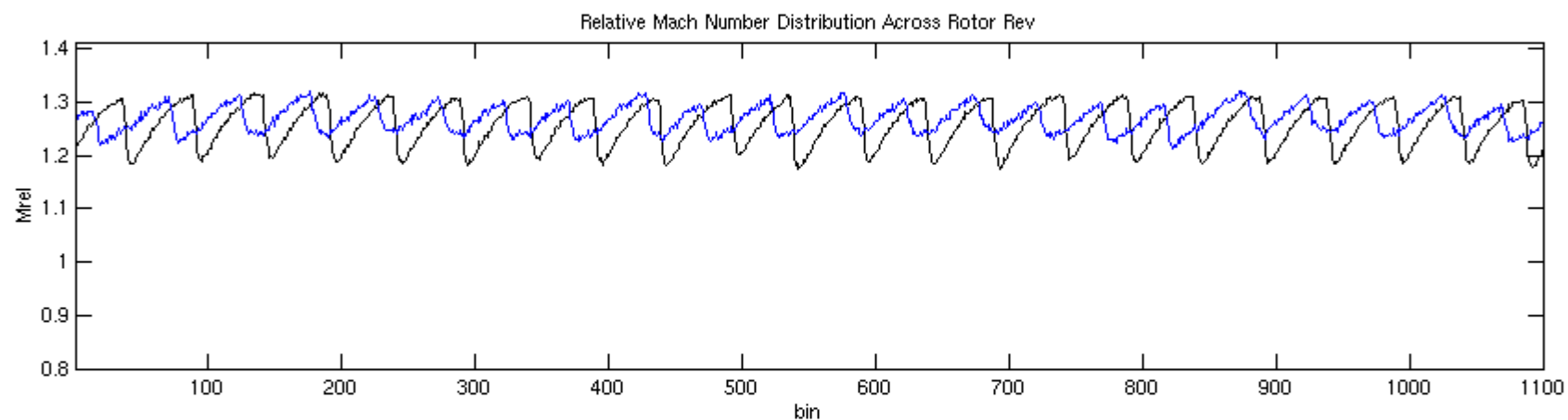
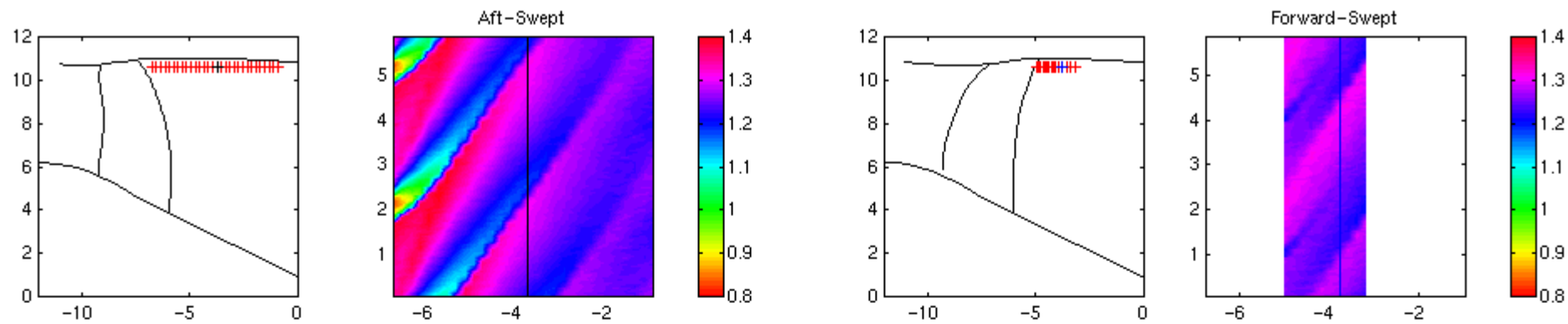


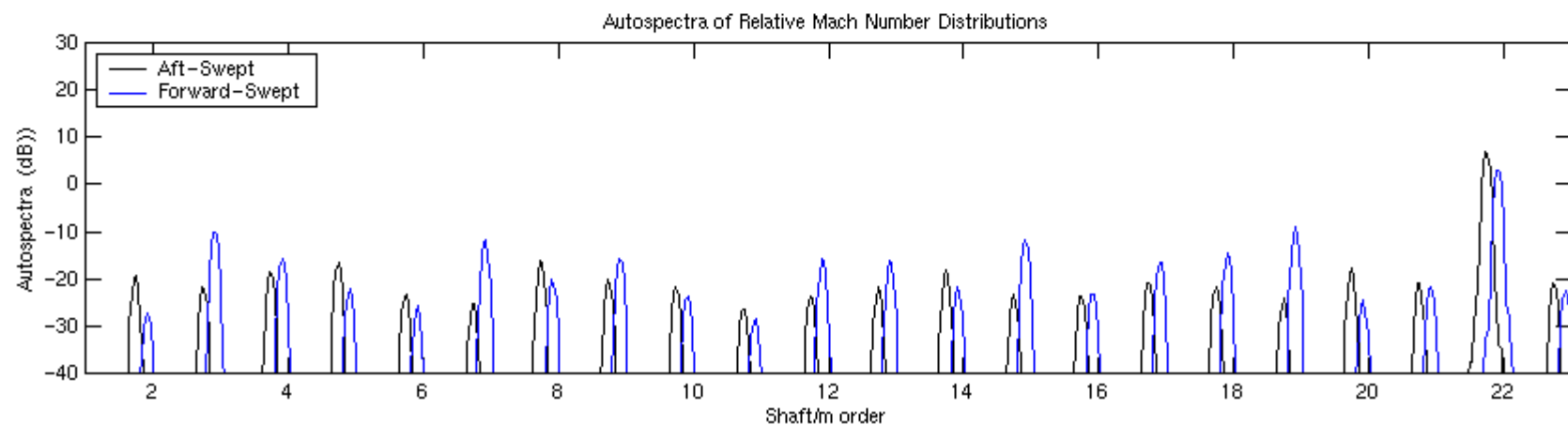
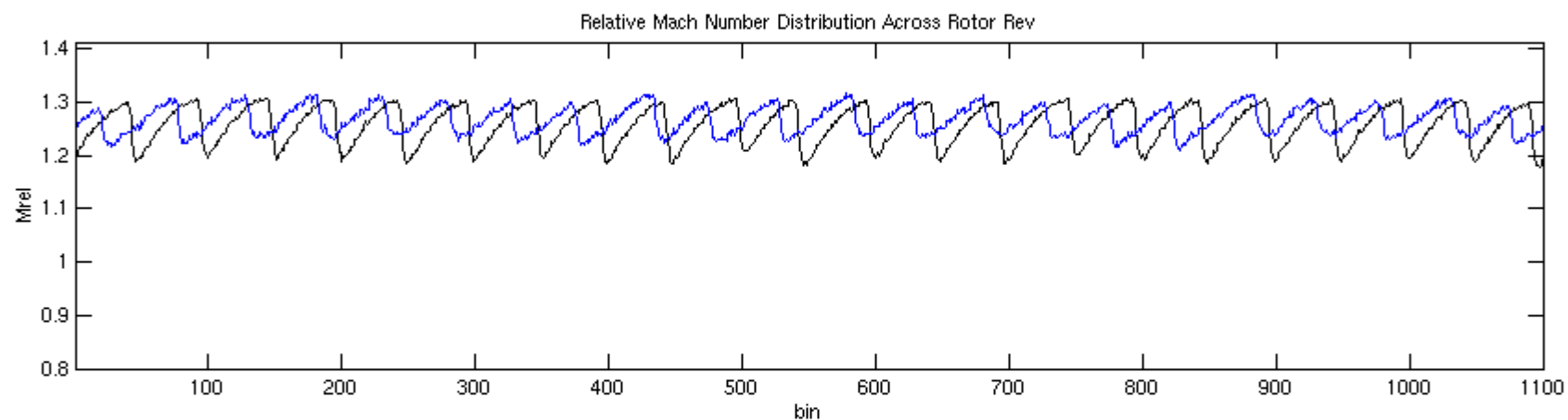
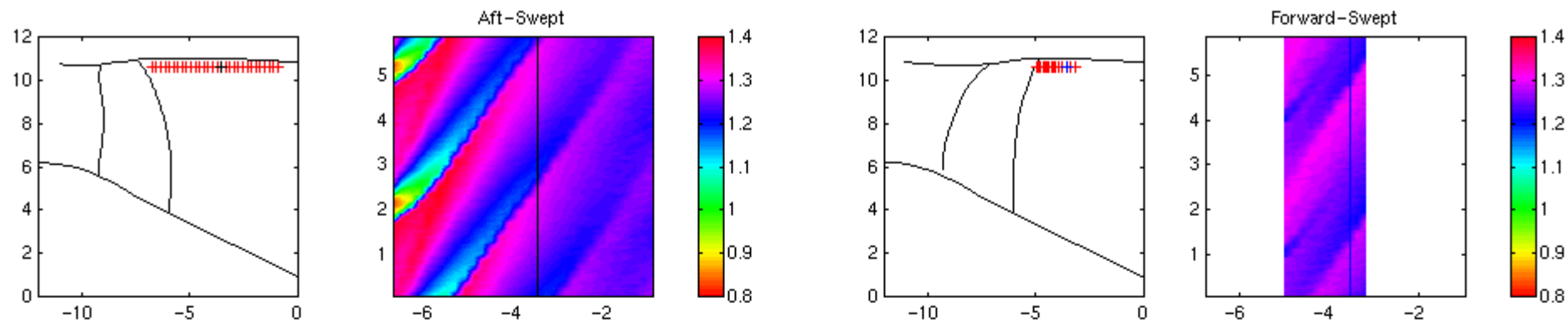


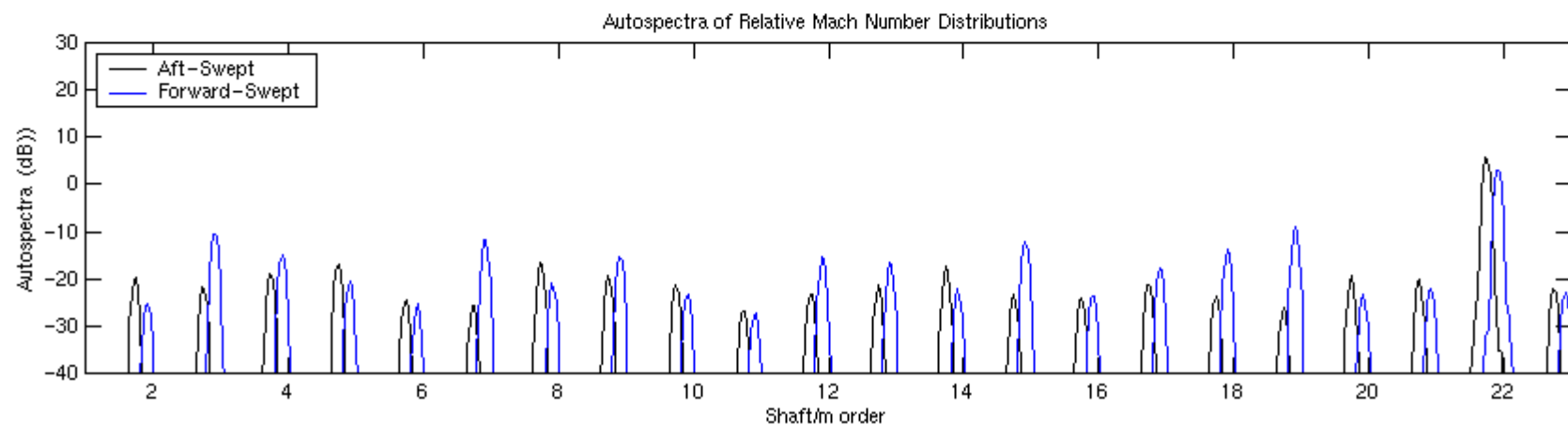
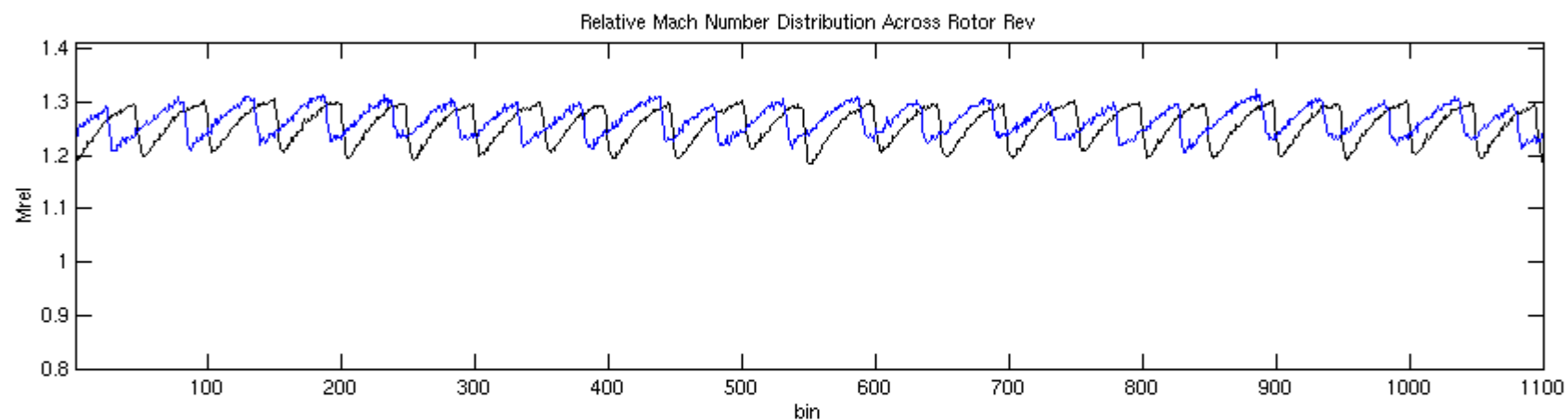
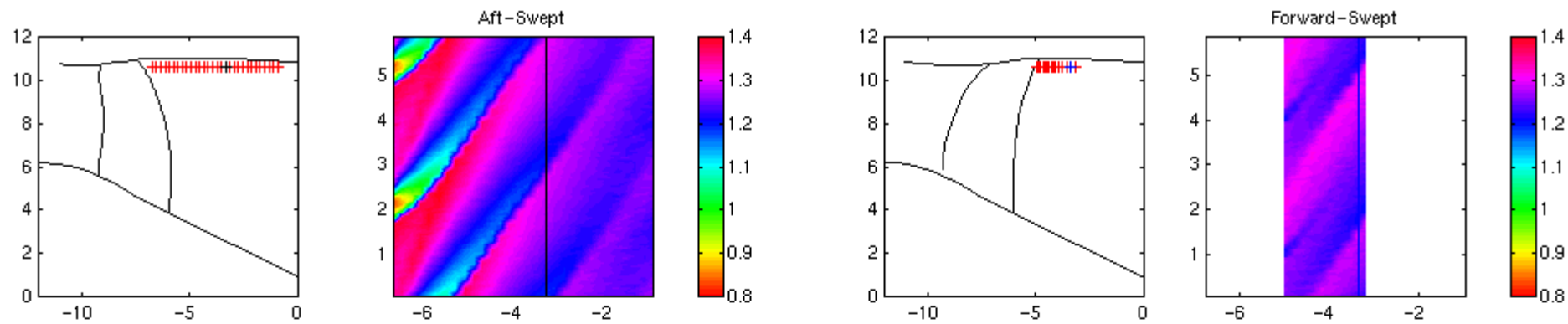


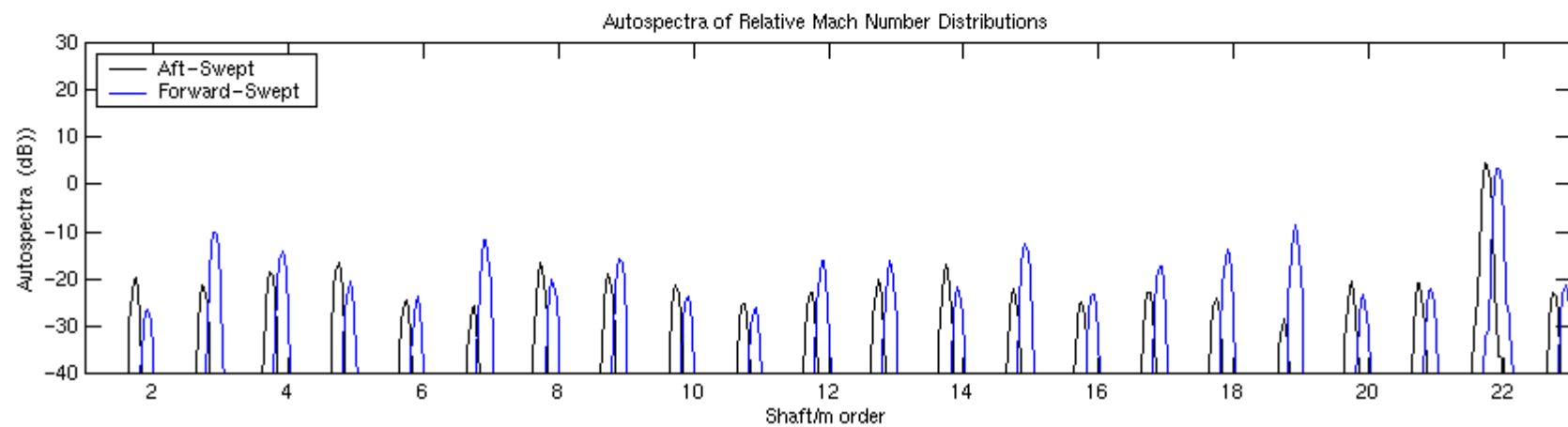
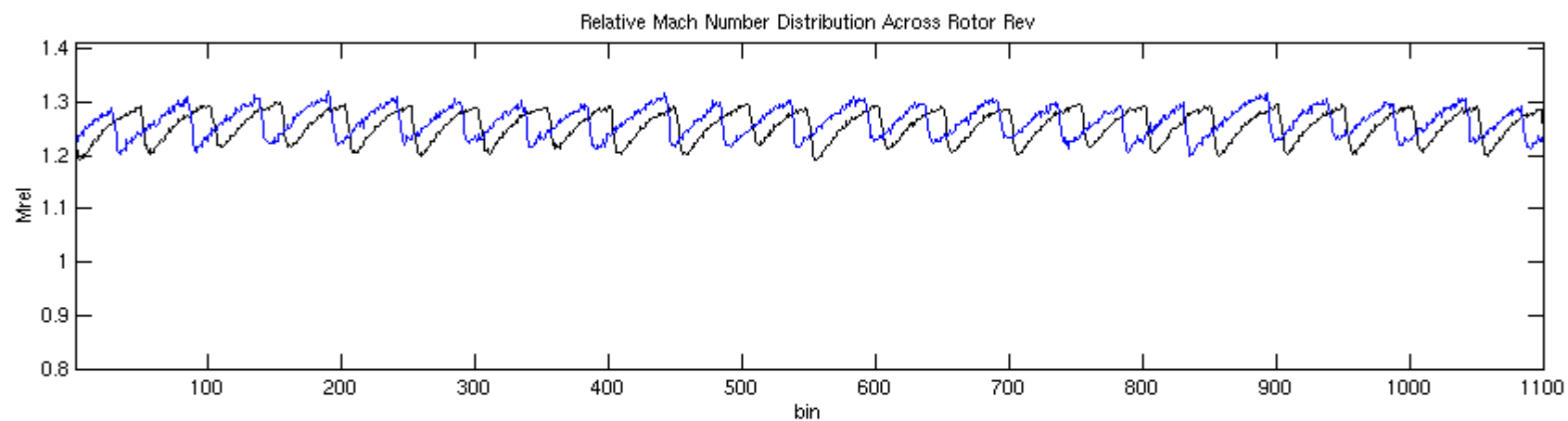
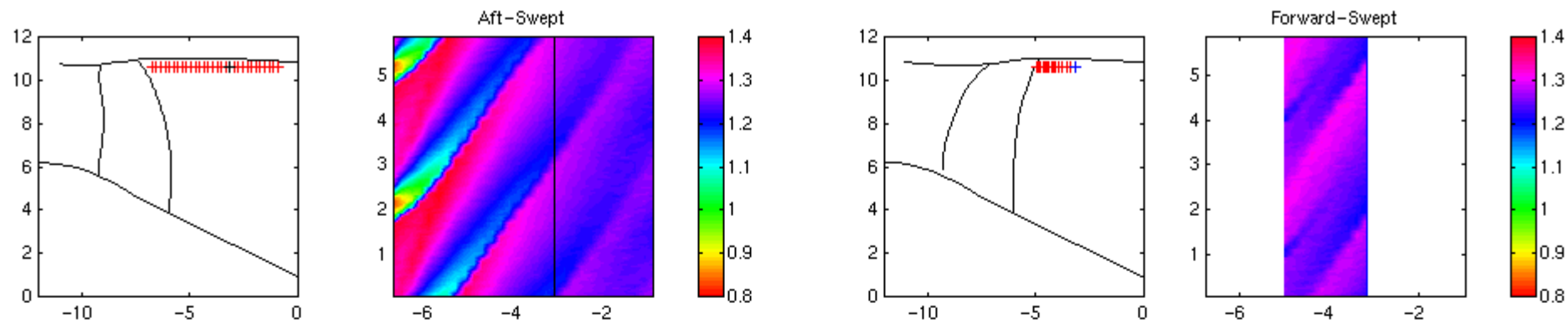


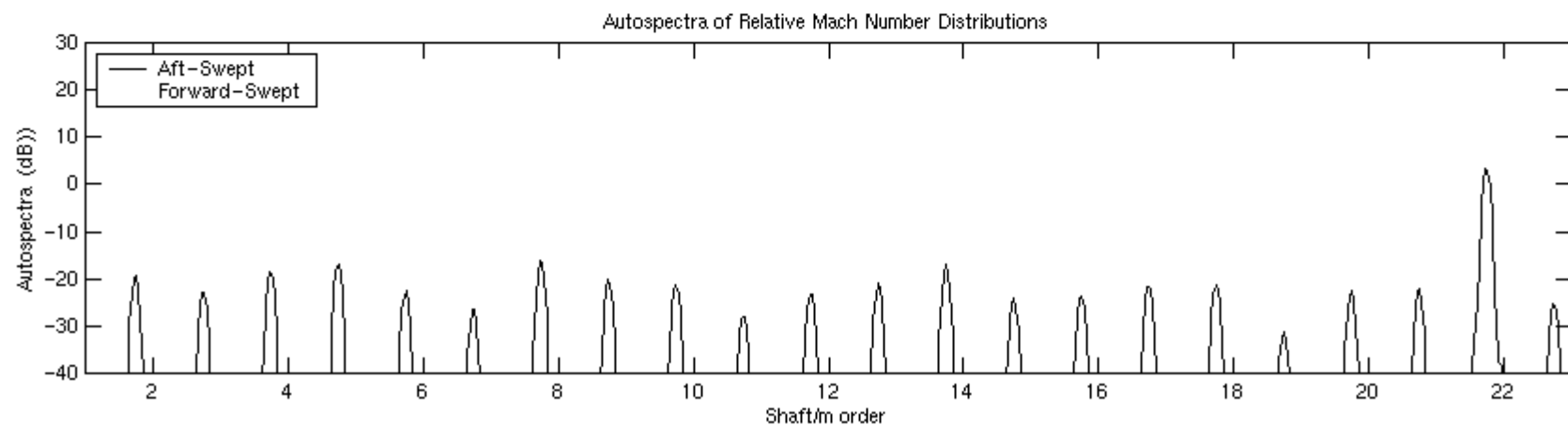
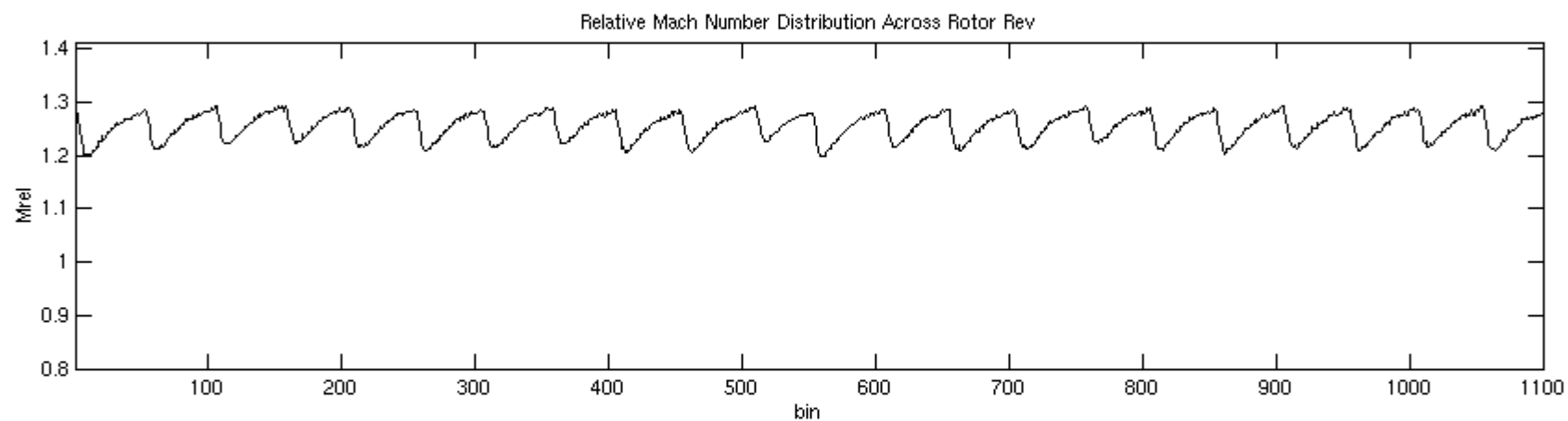
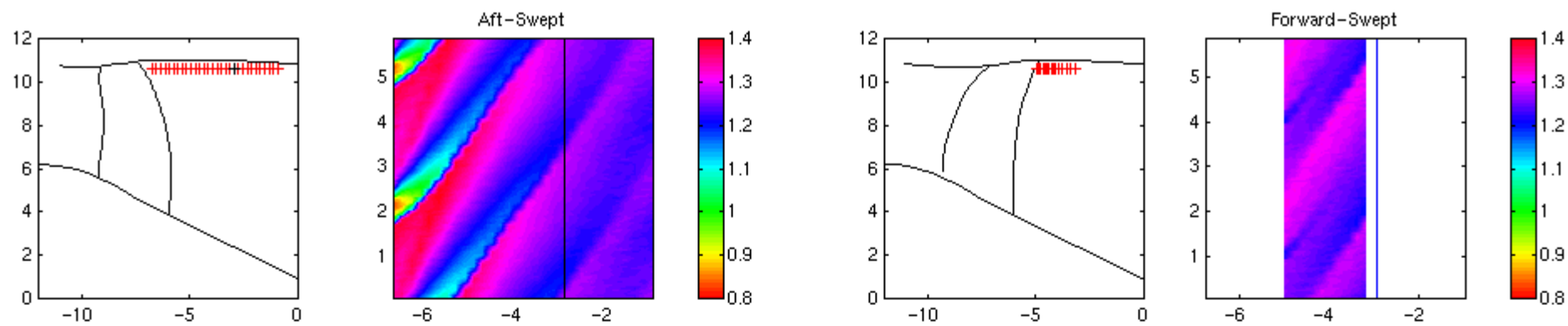


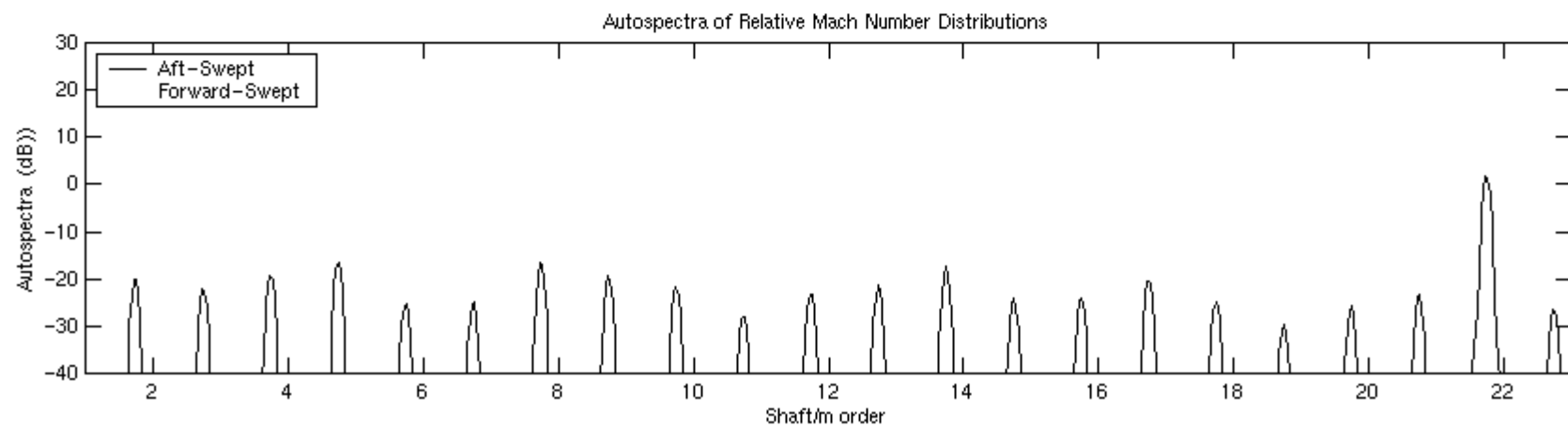
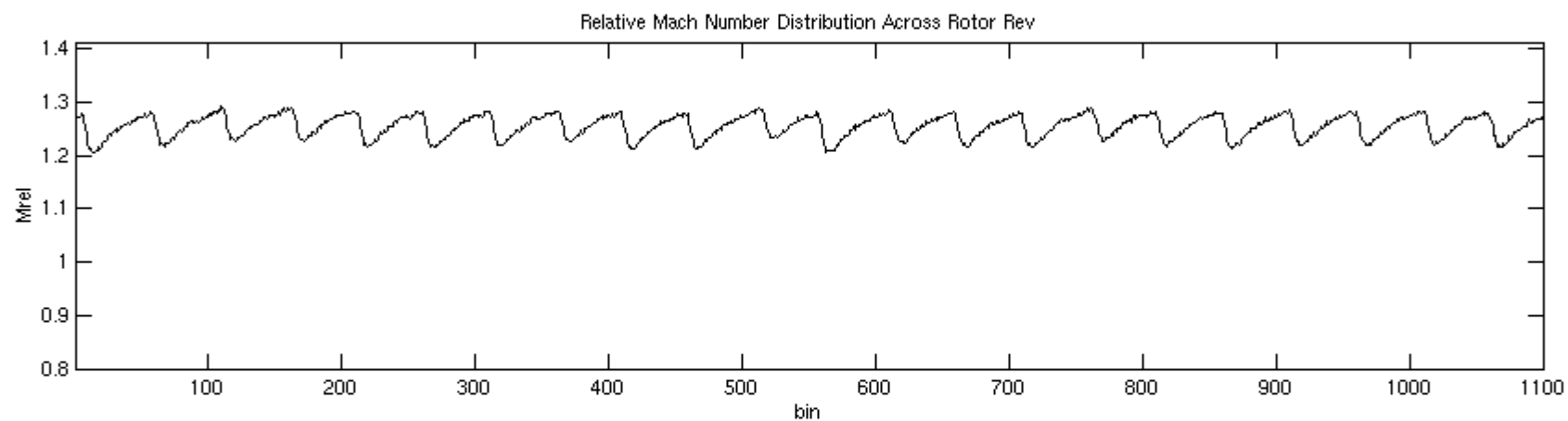
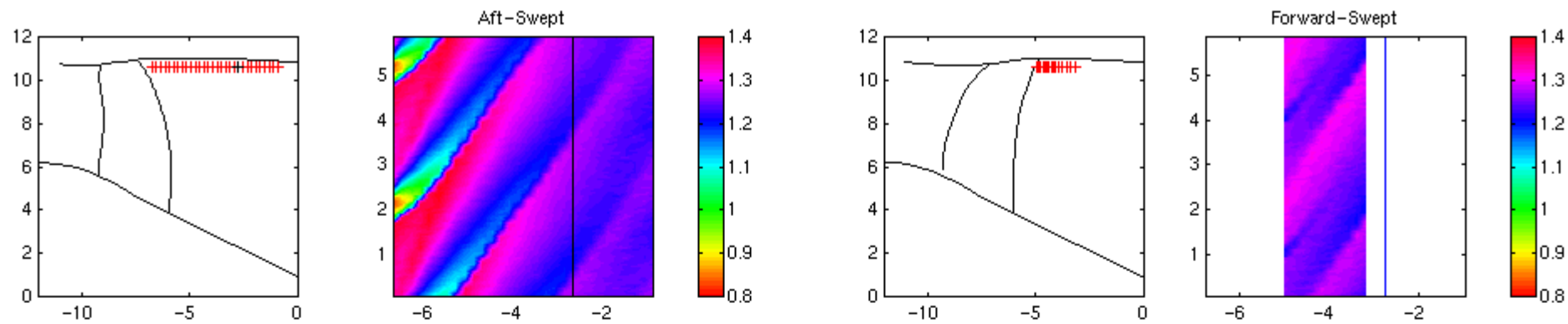


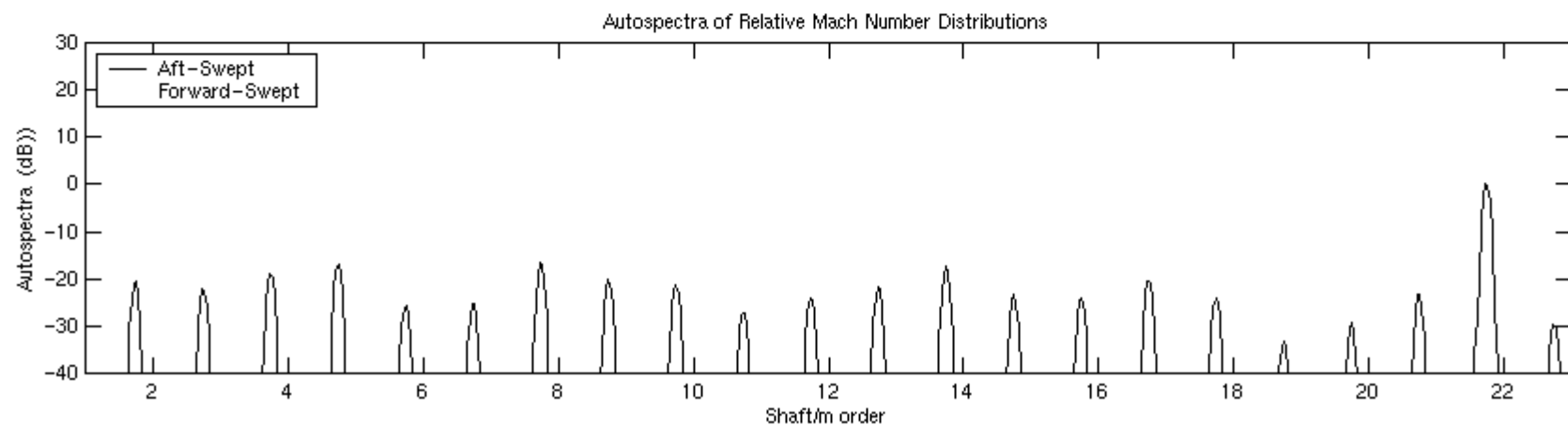
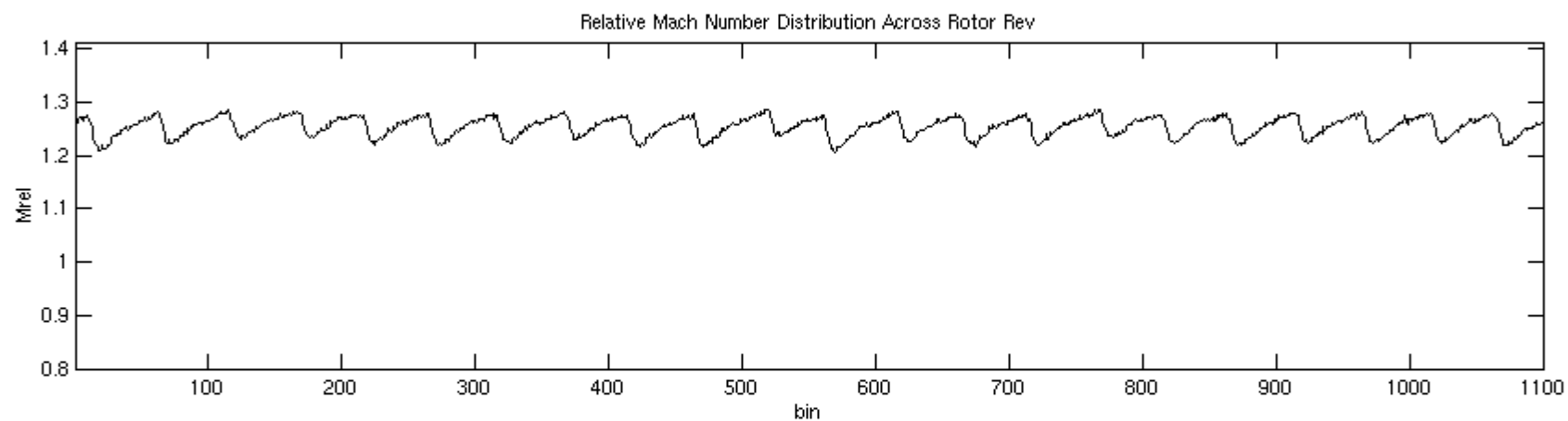
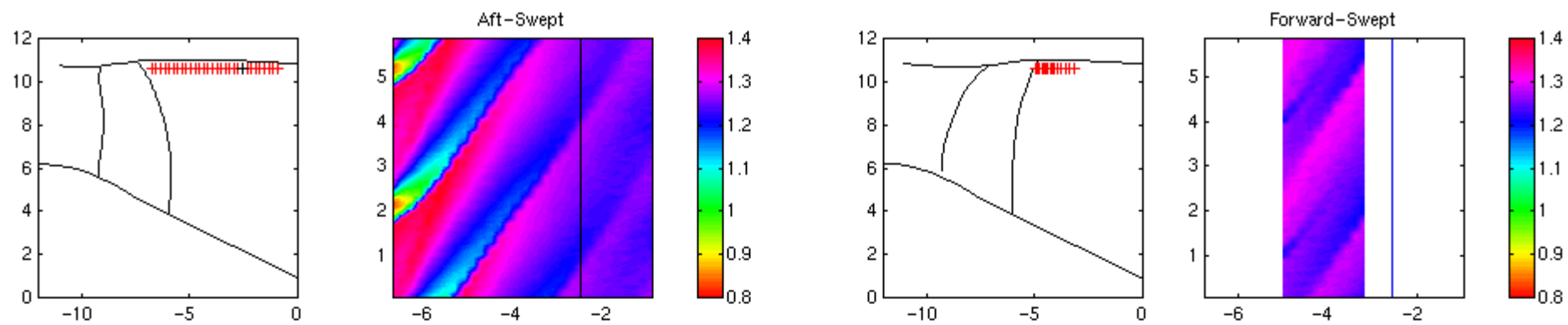


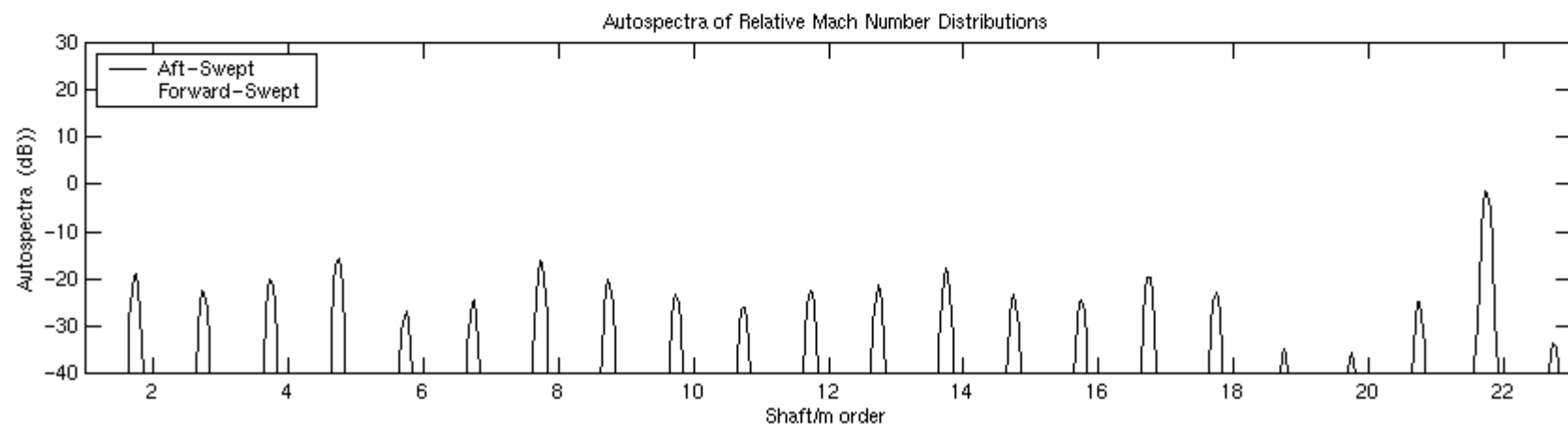
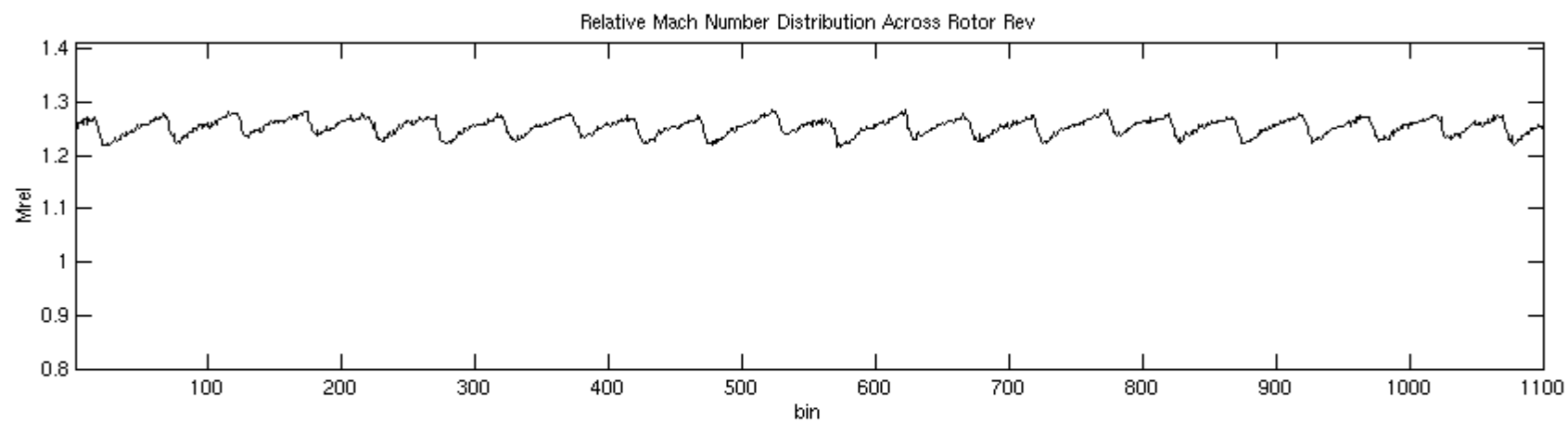
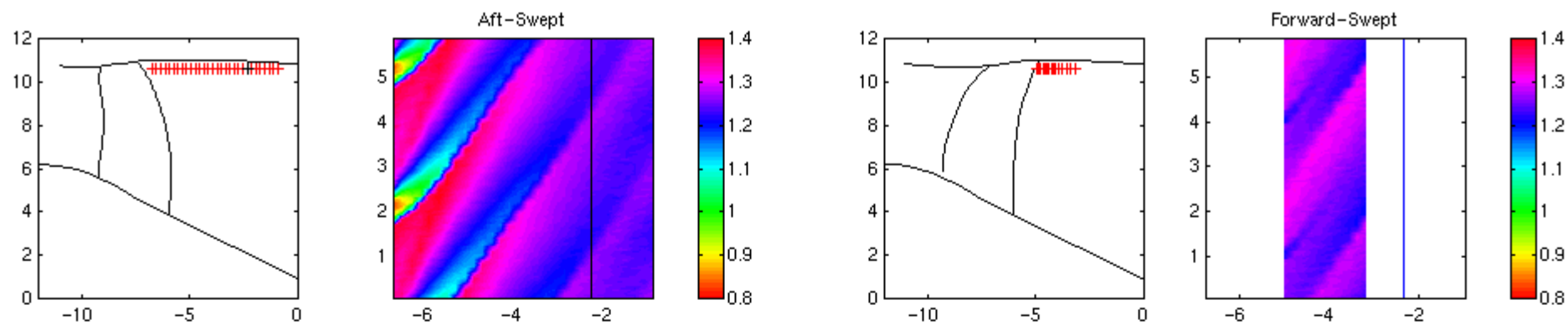


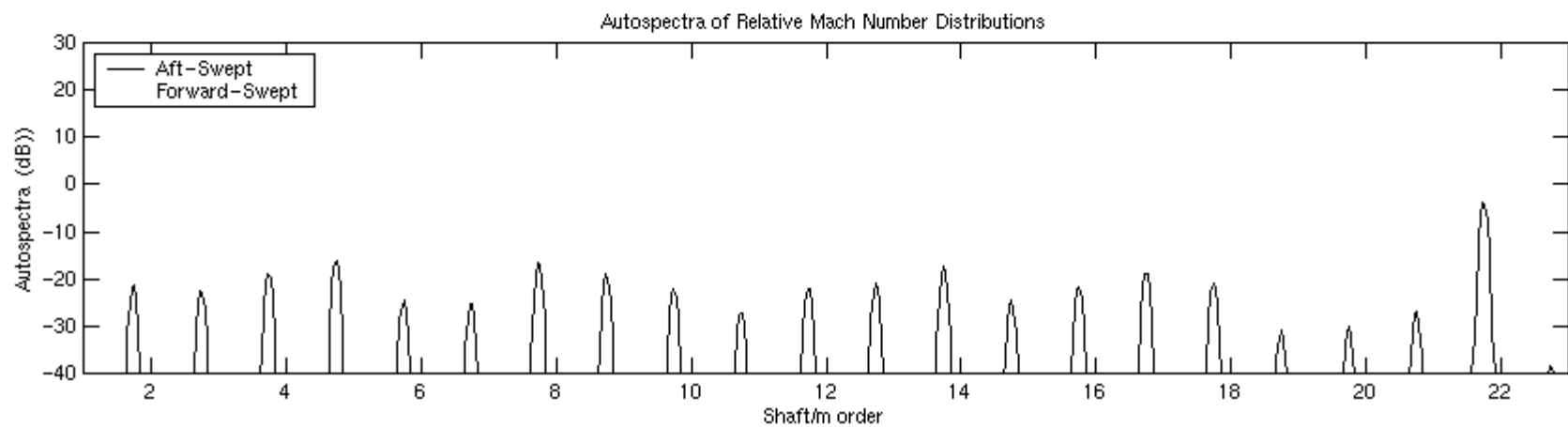
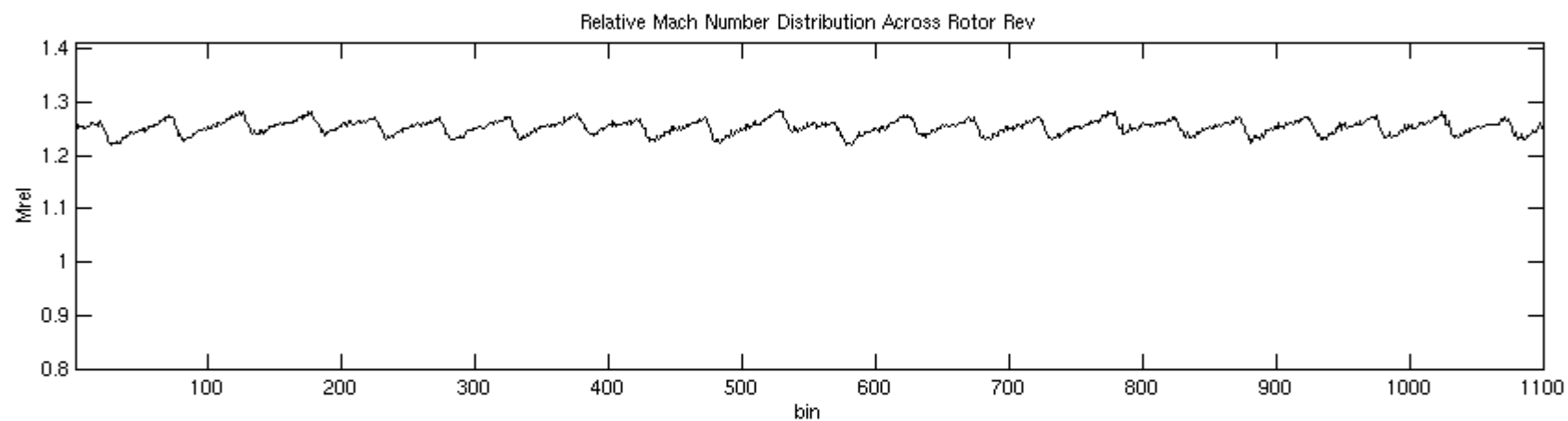
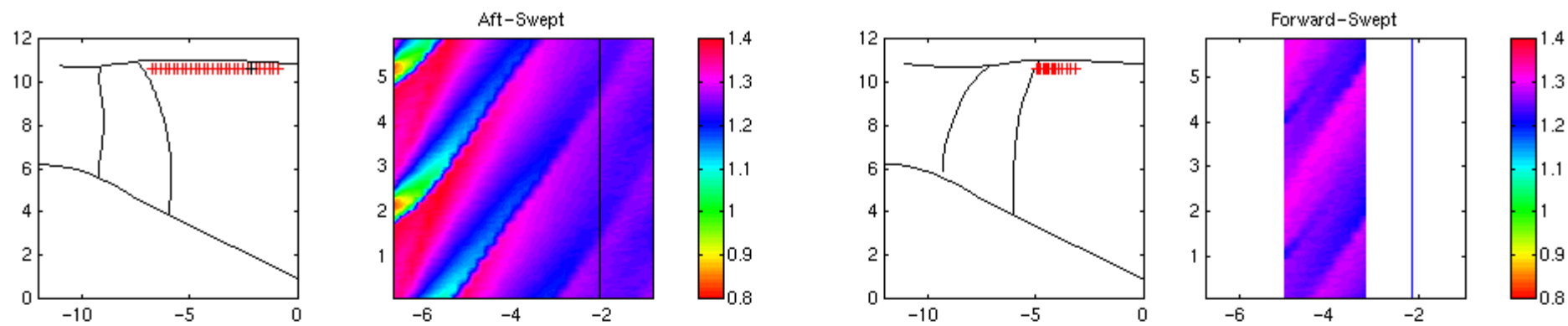


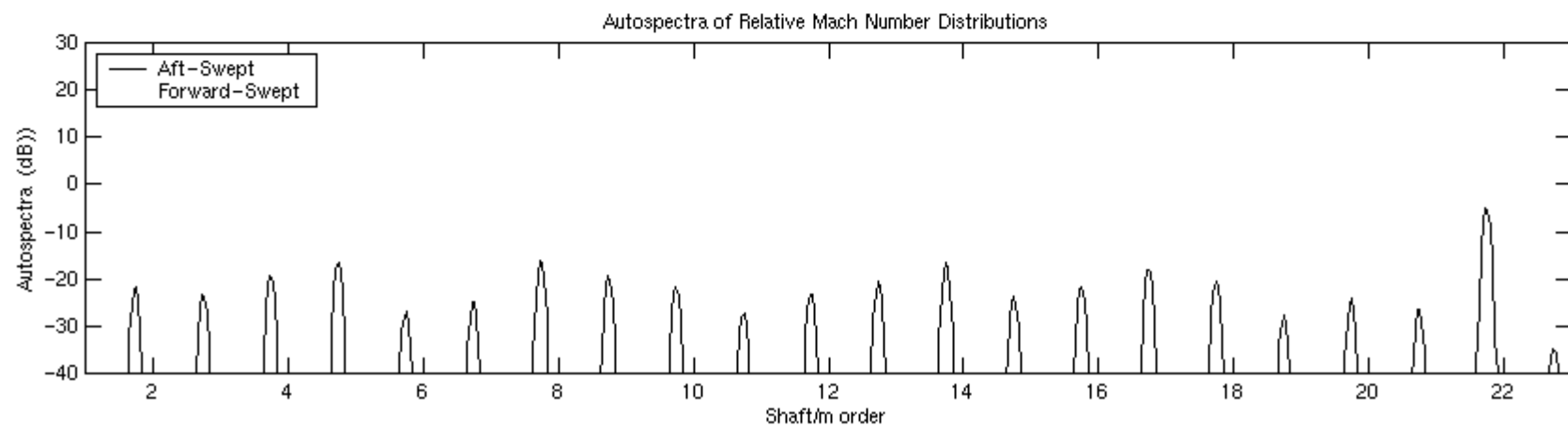
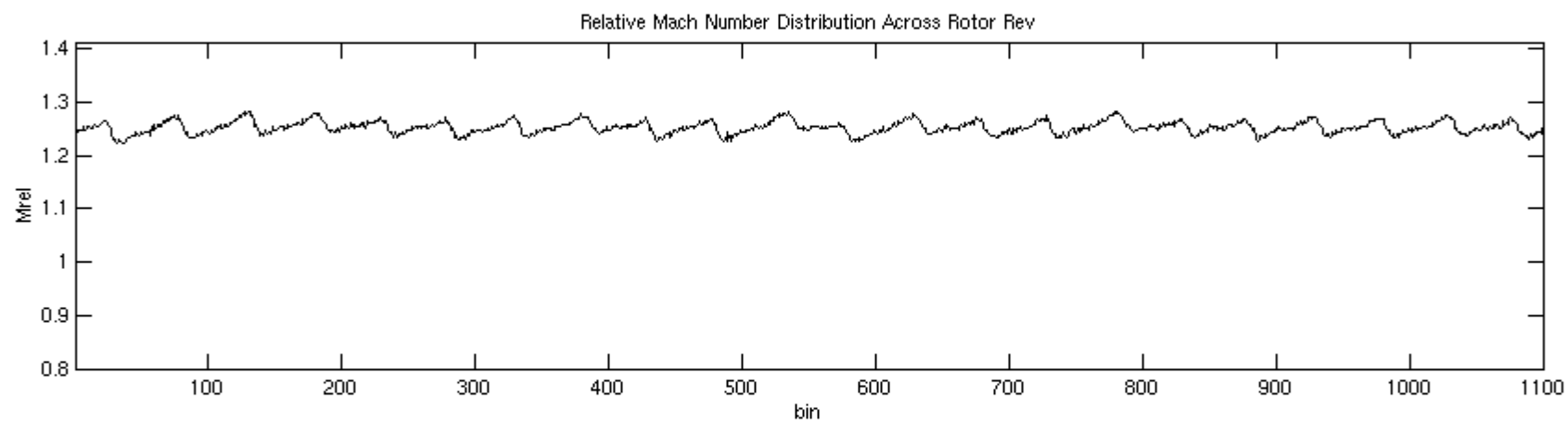
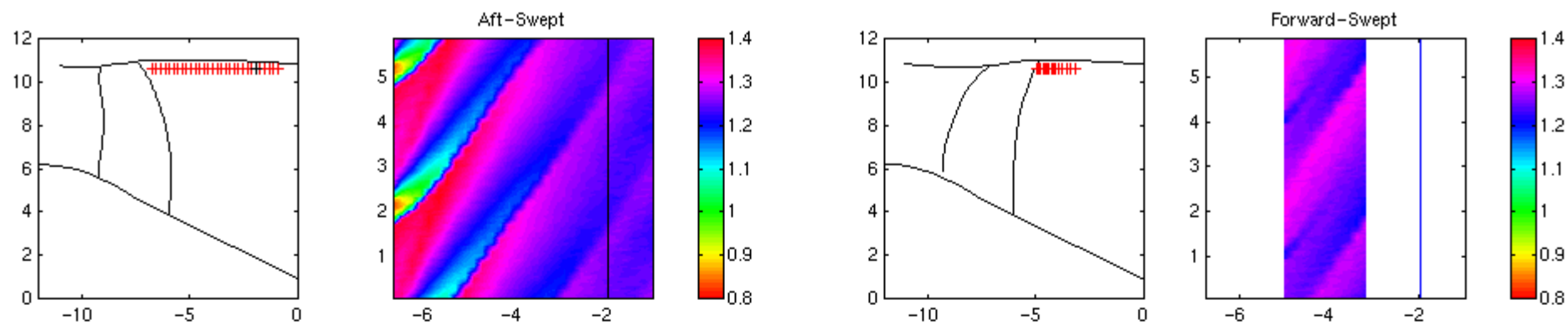


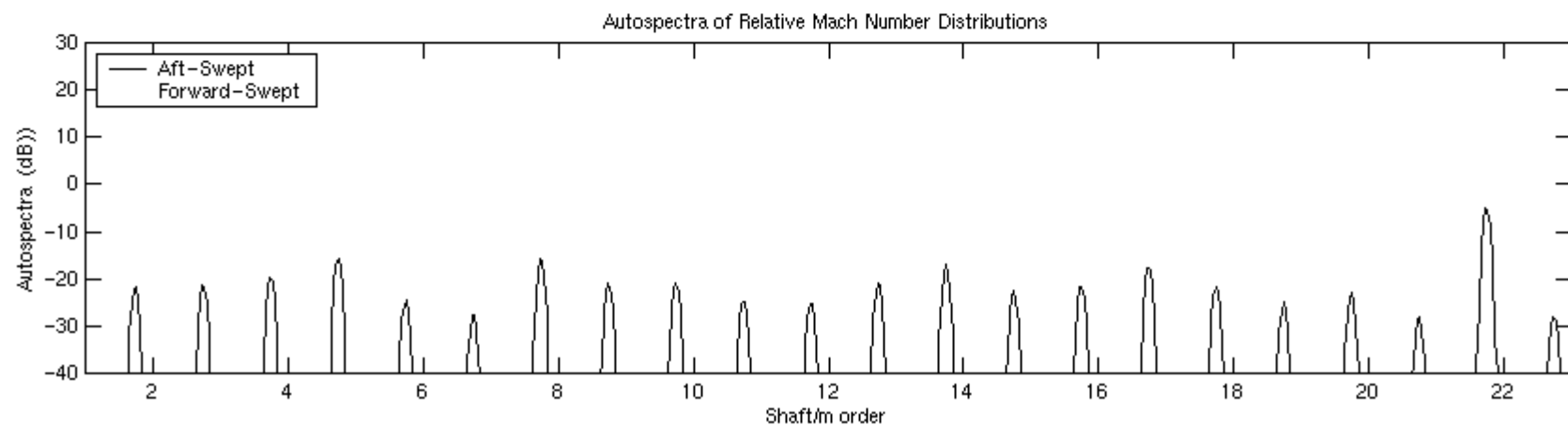
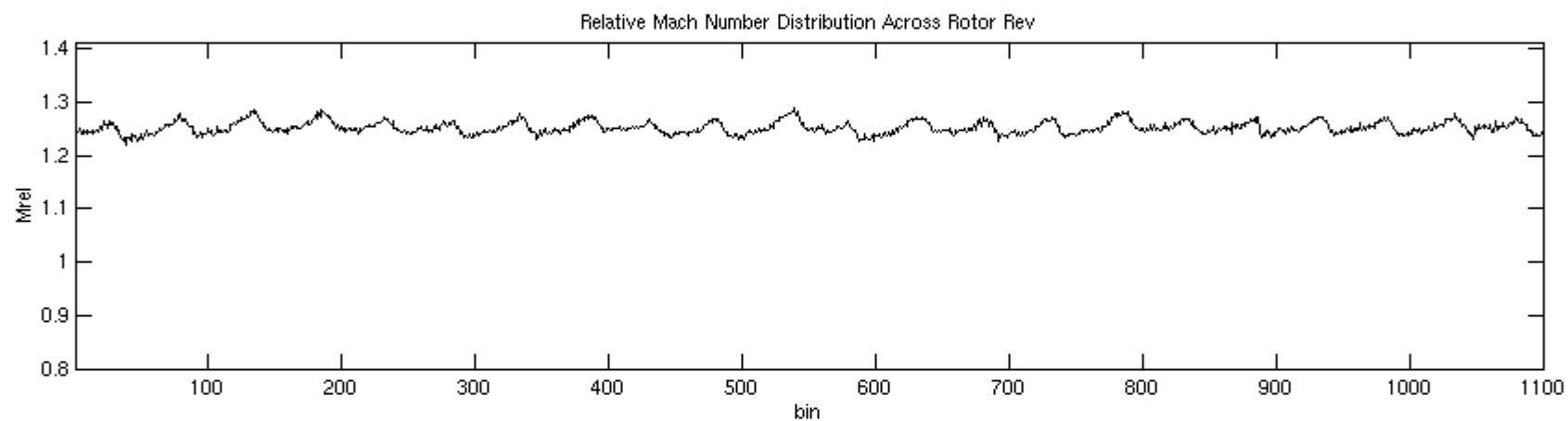
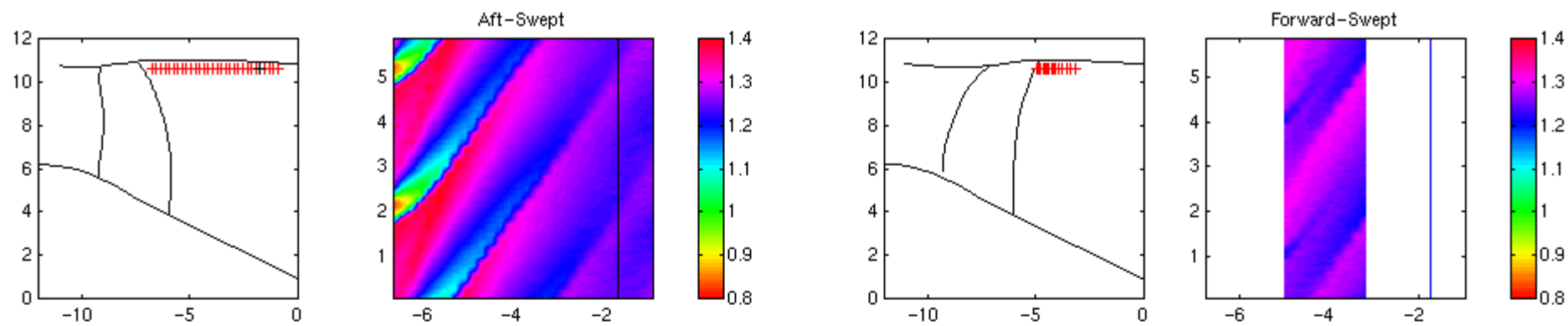


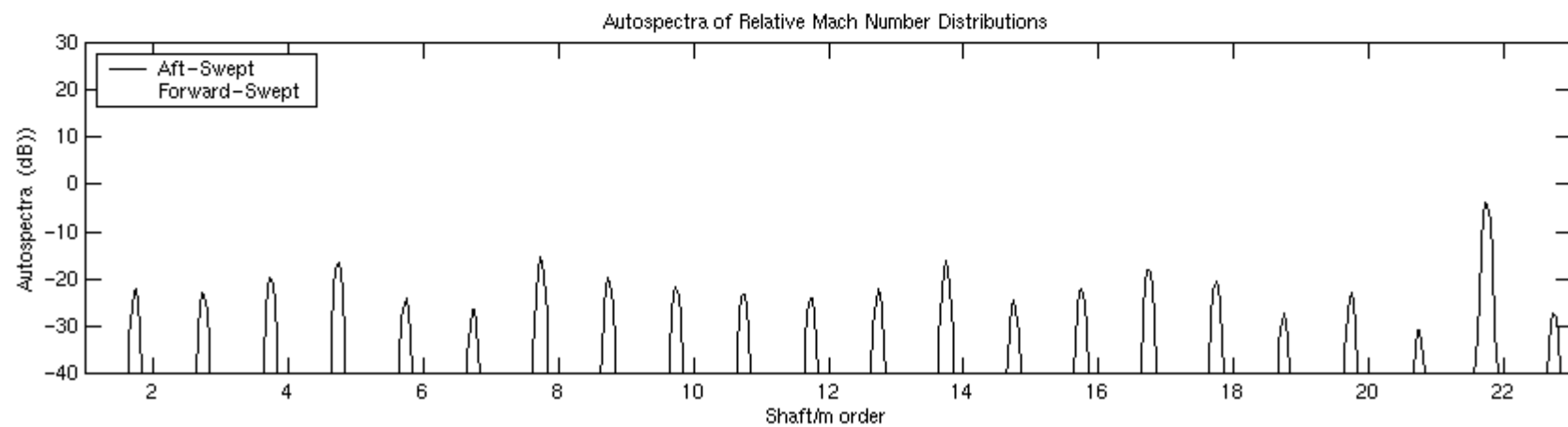
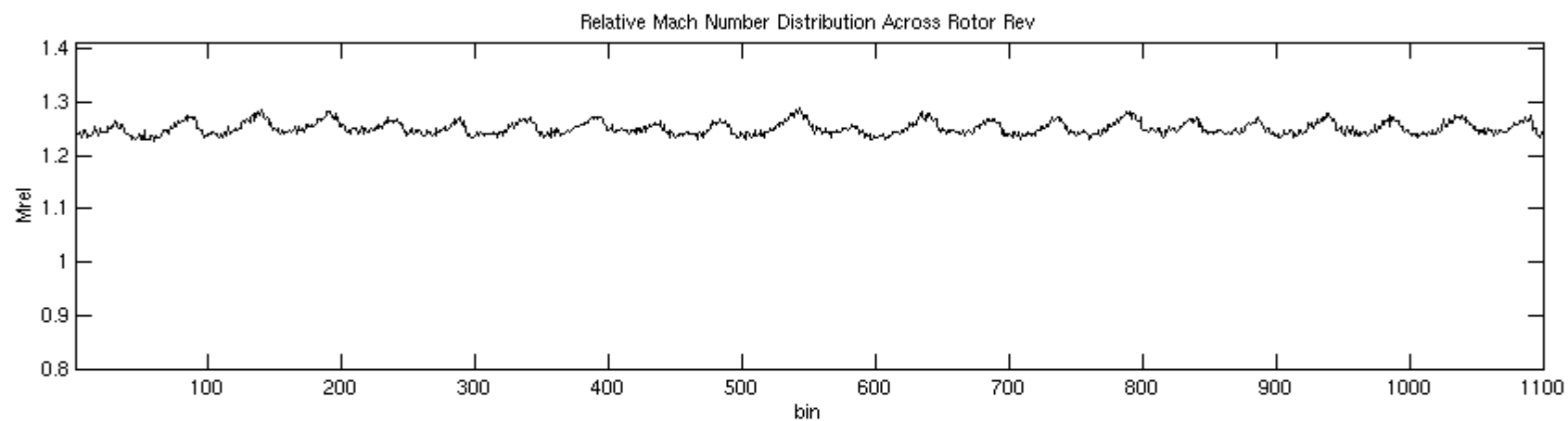
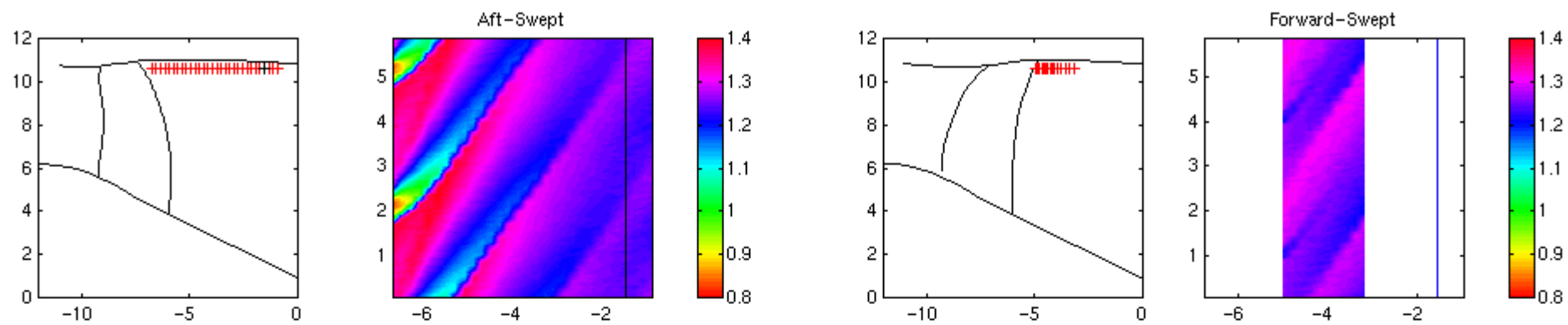


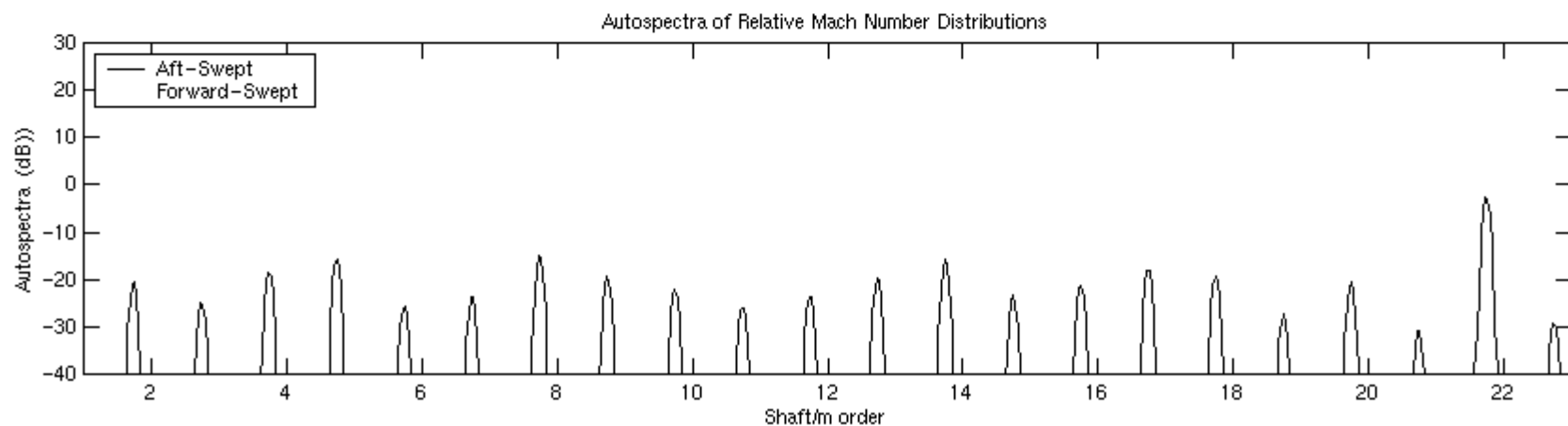
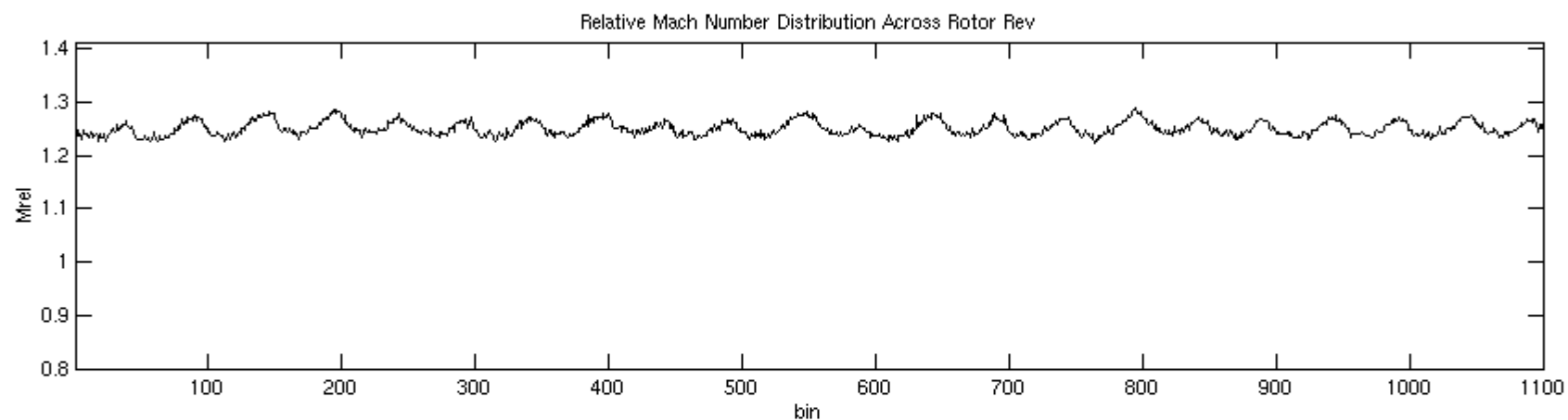
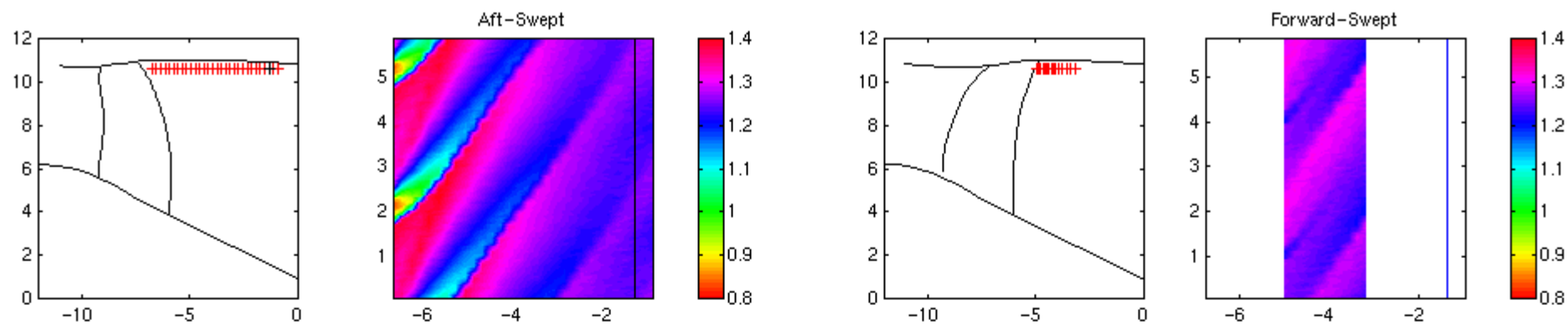


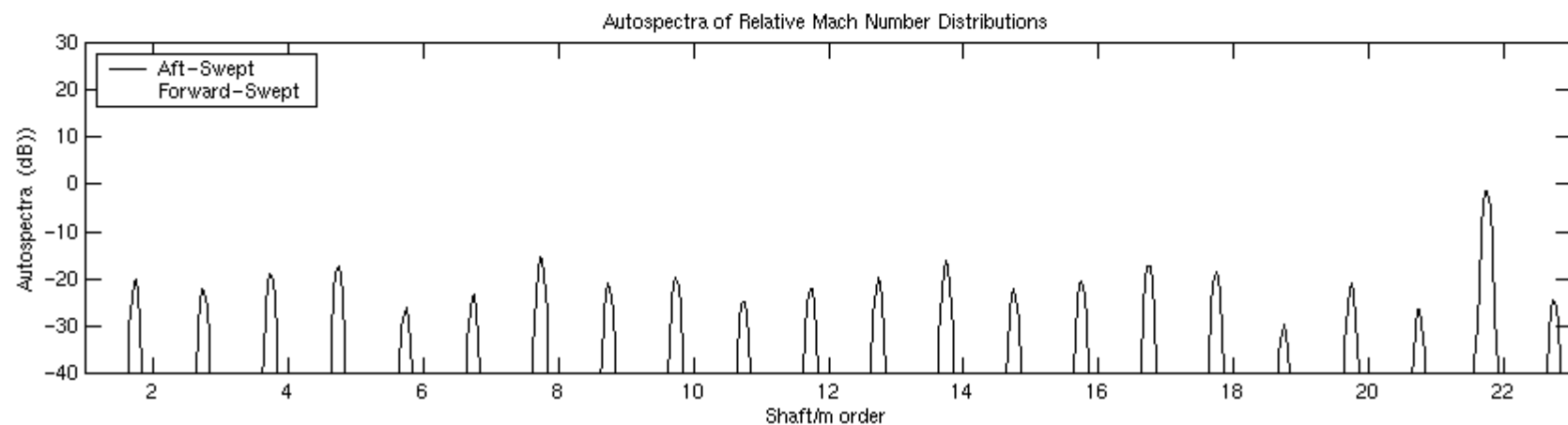
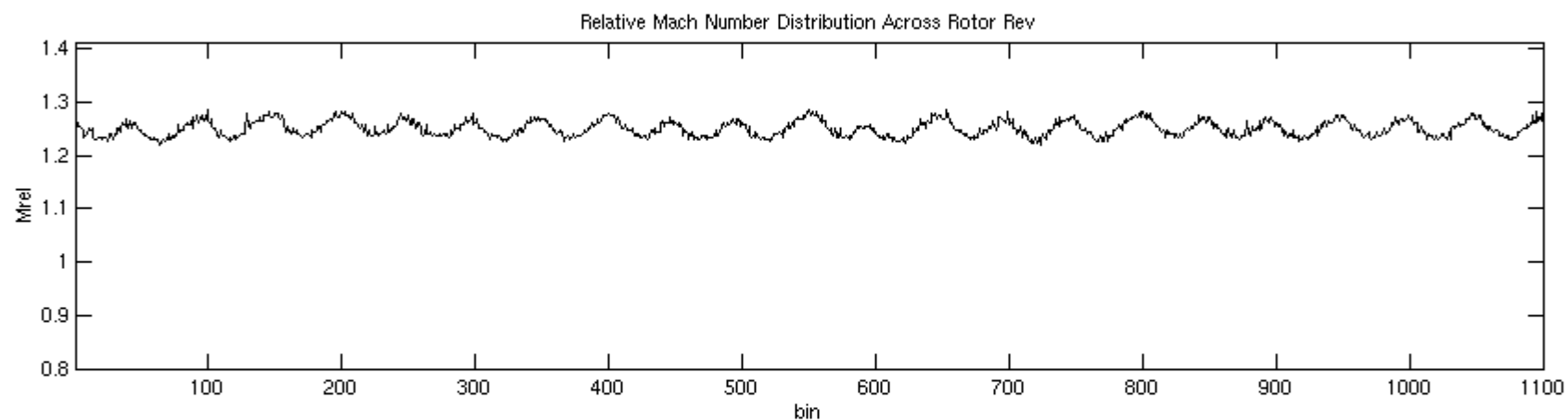
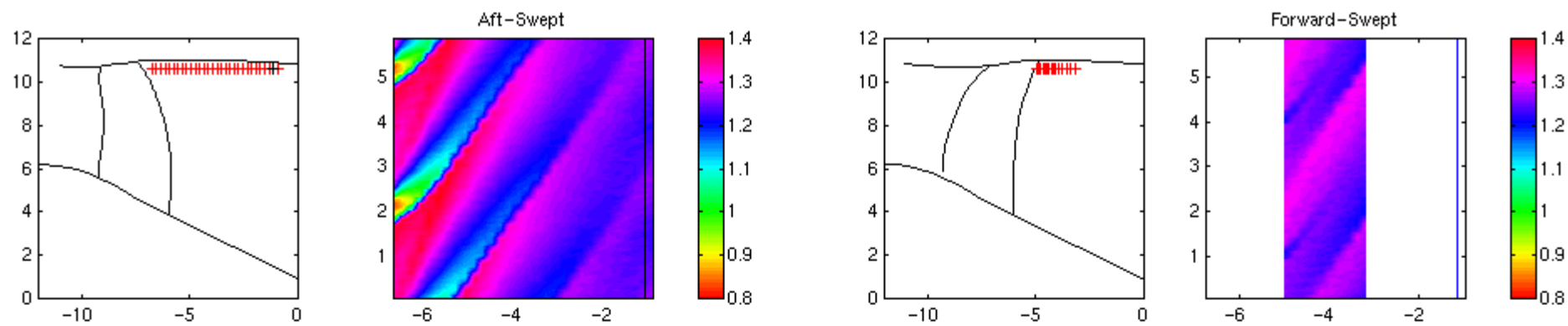












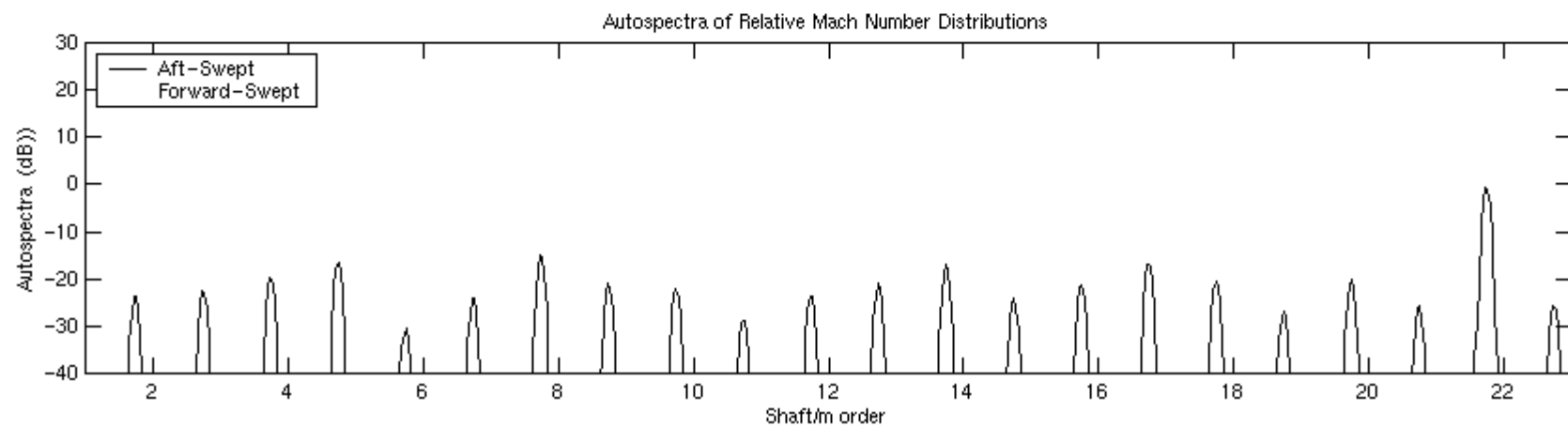
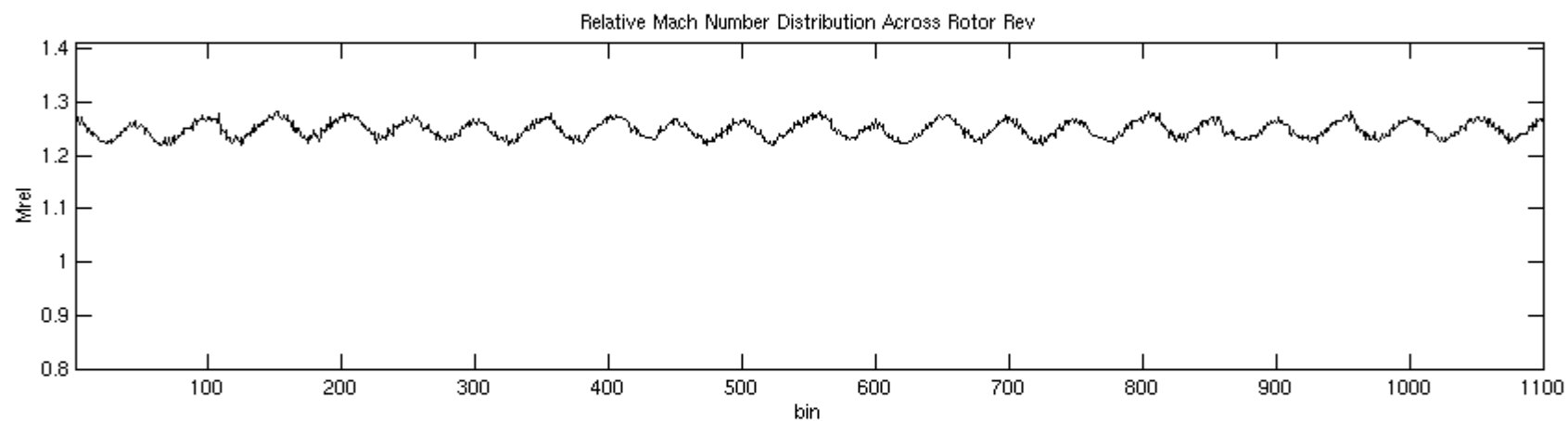
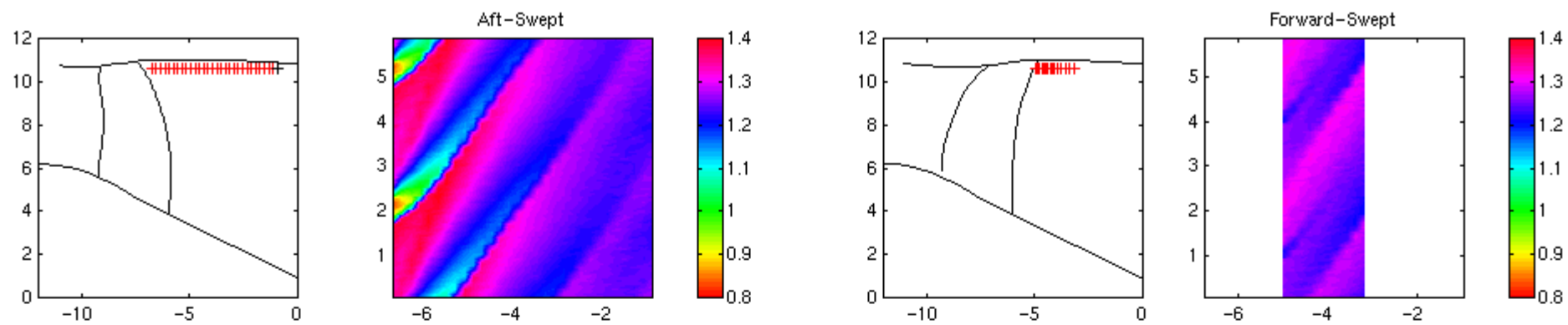
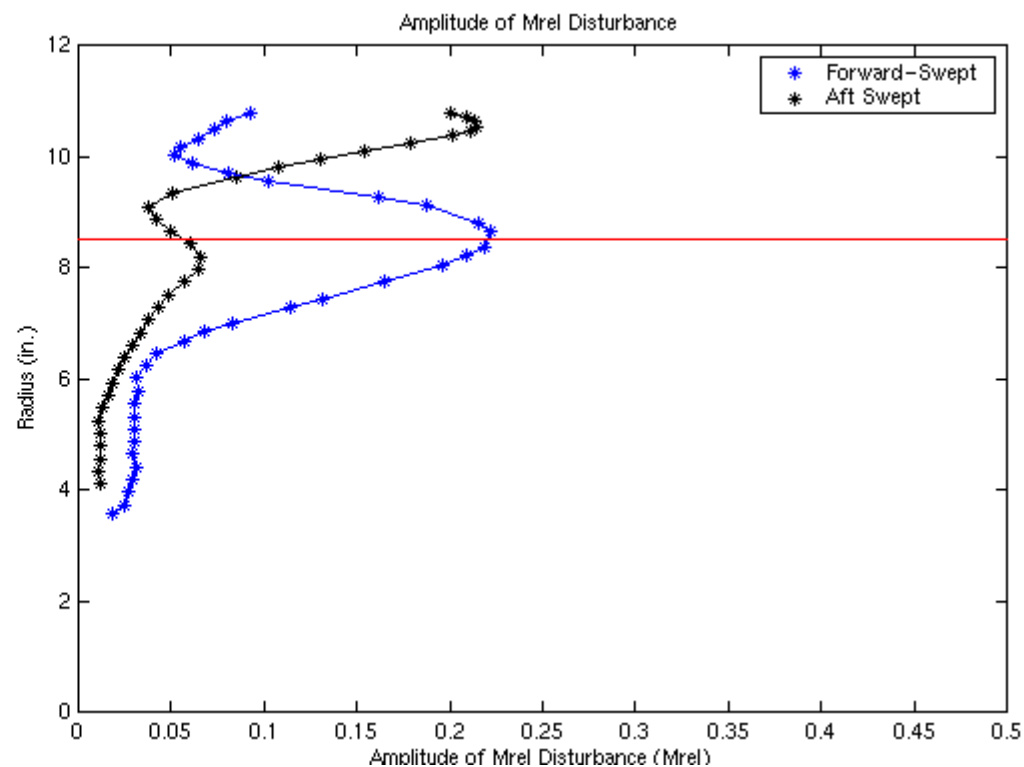
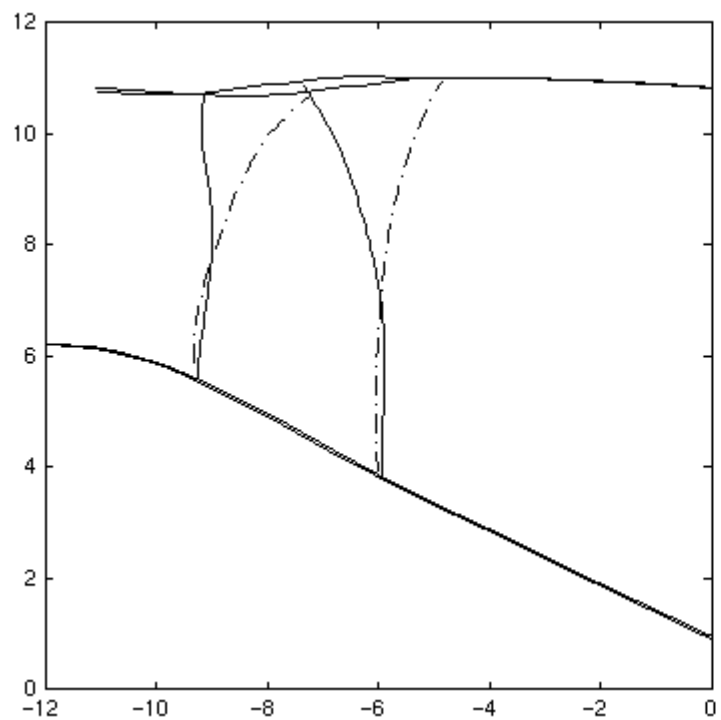
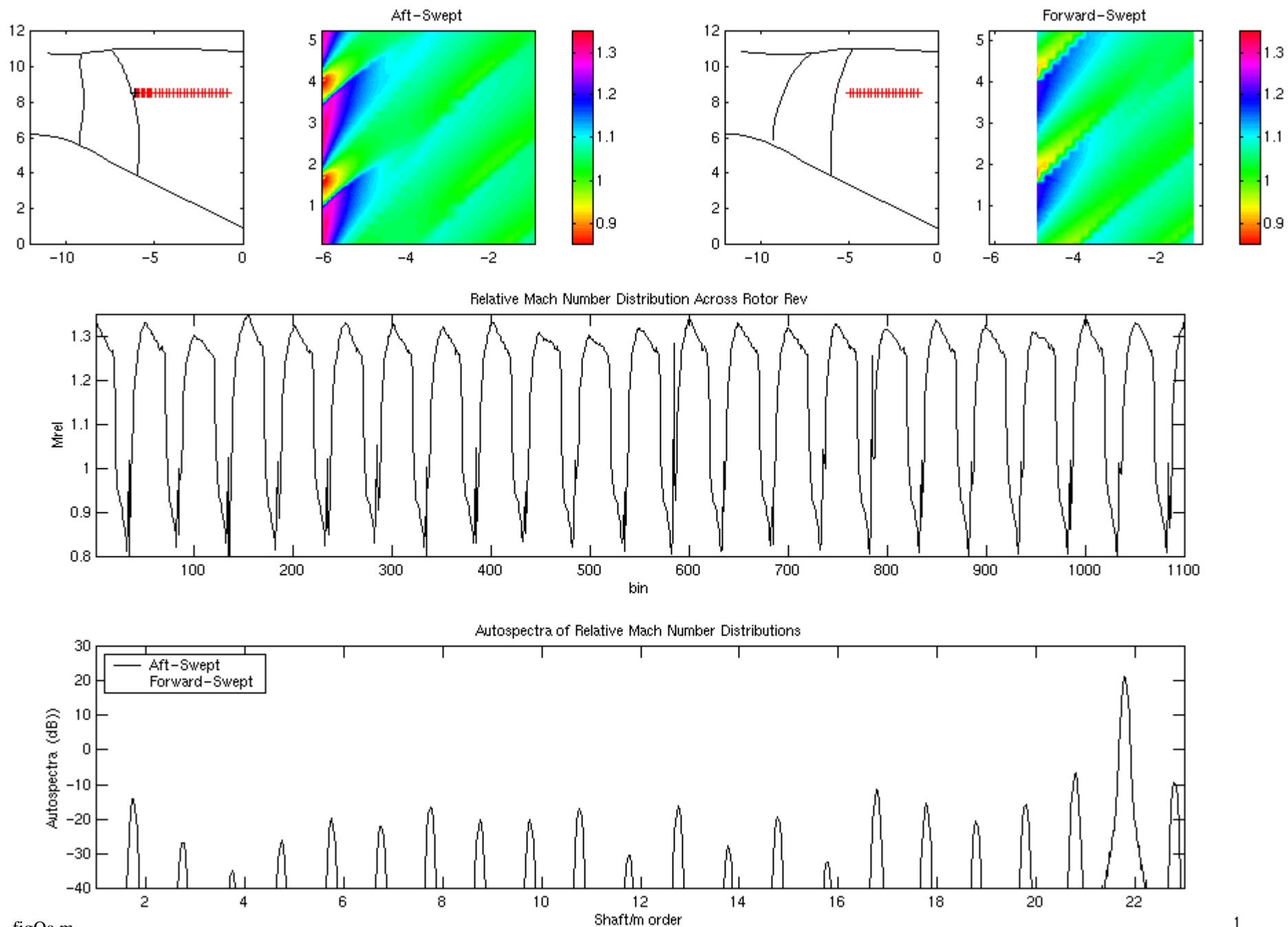
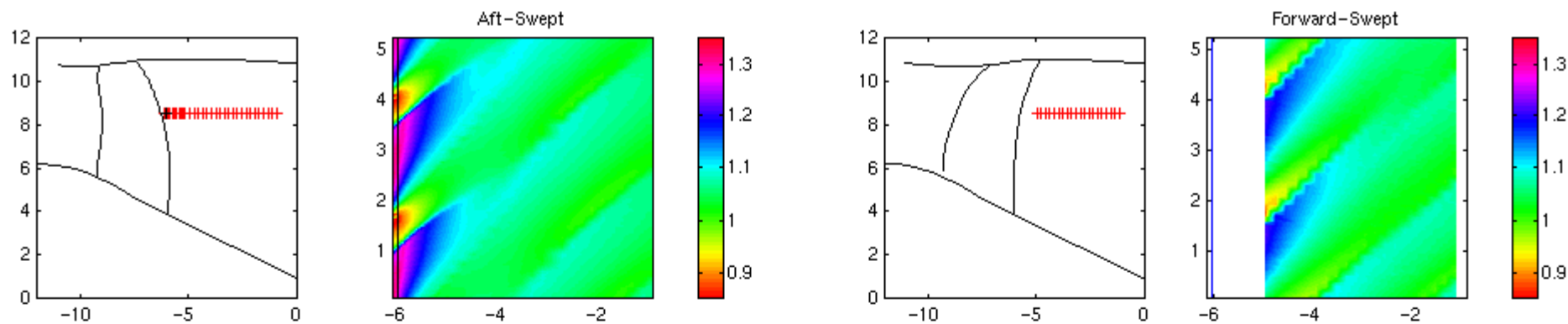


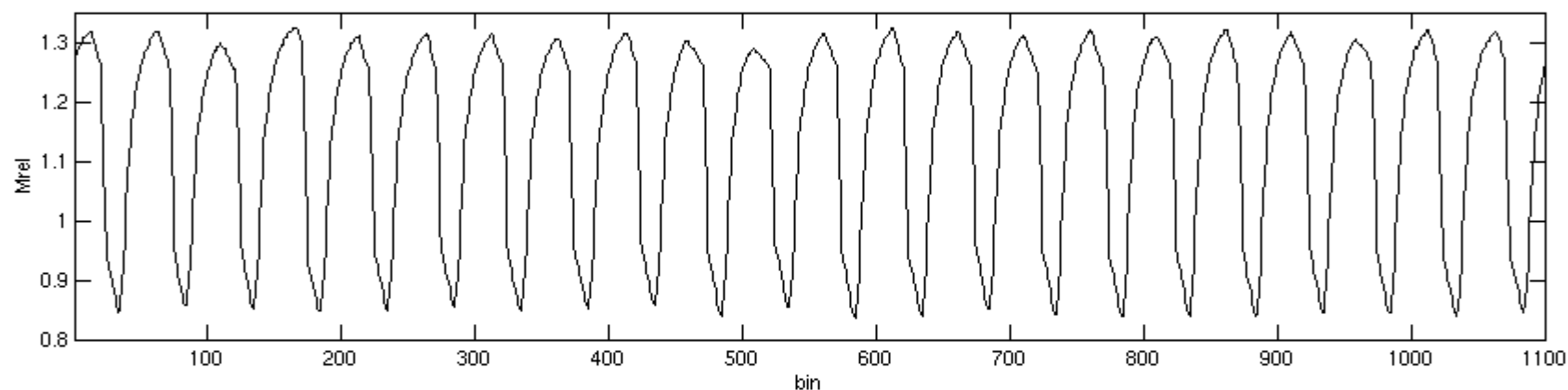
Figure 35.—Slideshow (32 slides) which compares the flows measured upstream of the aft-swept and forward-swept fans at $r = 8.5$ in. with both rotors at the high-speed condition. The first slide in the sequence illustrates where the data presented in the succeeding slides was obtained.



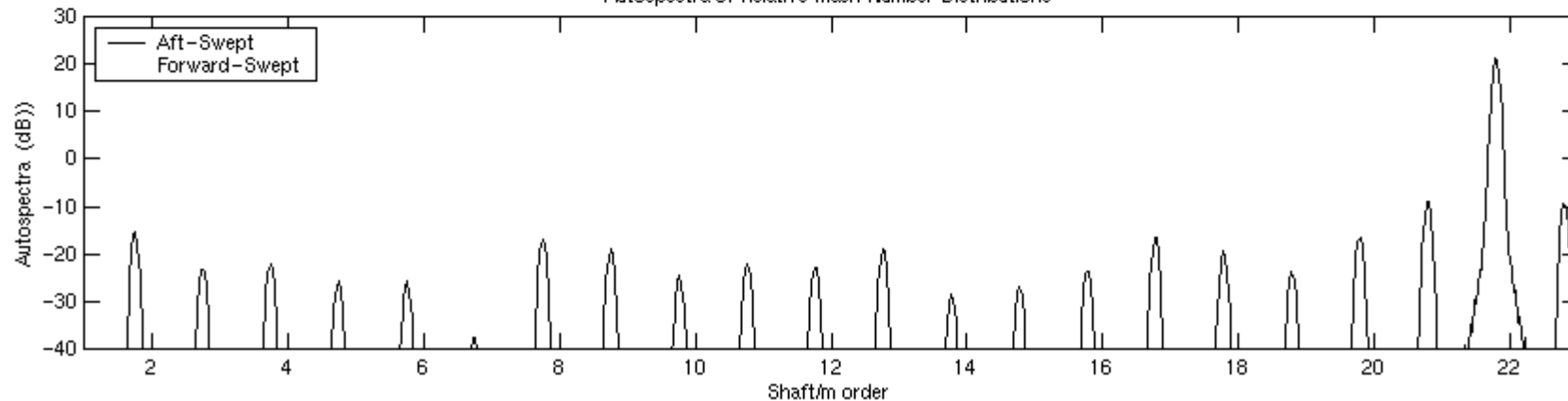


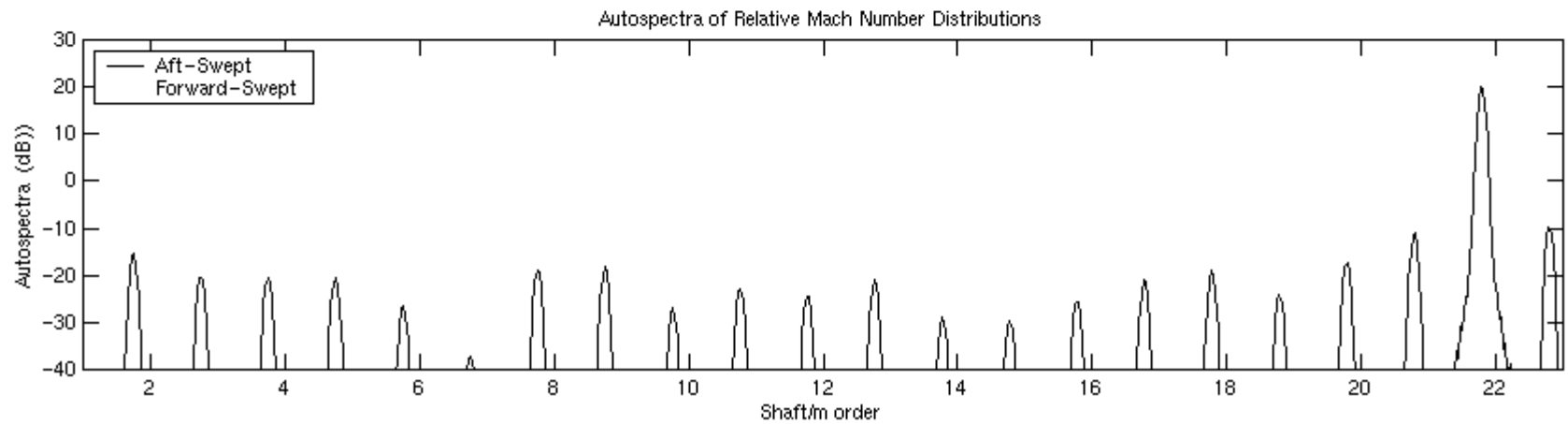
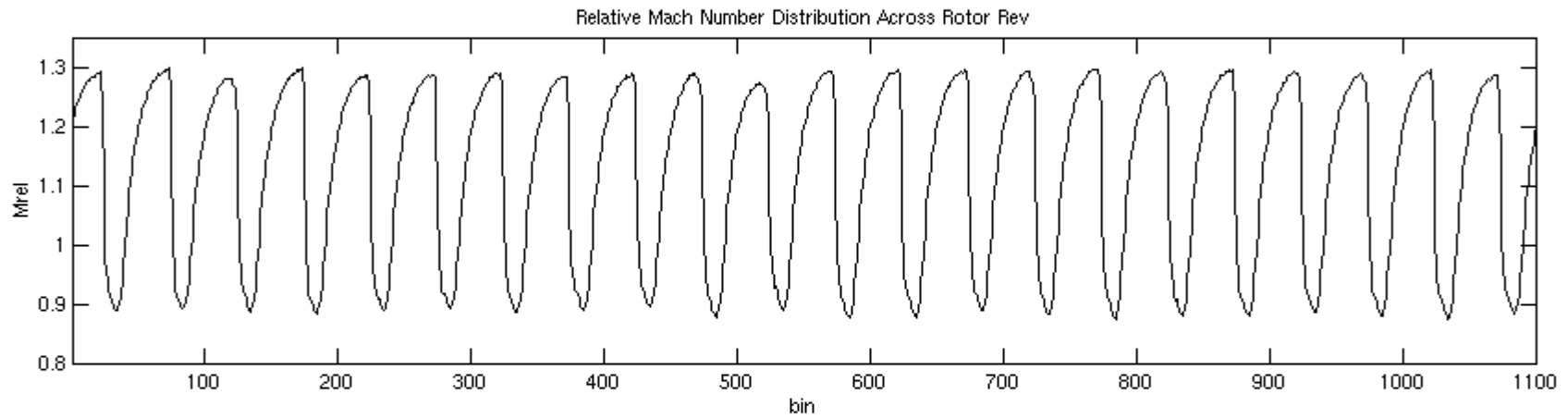
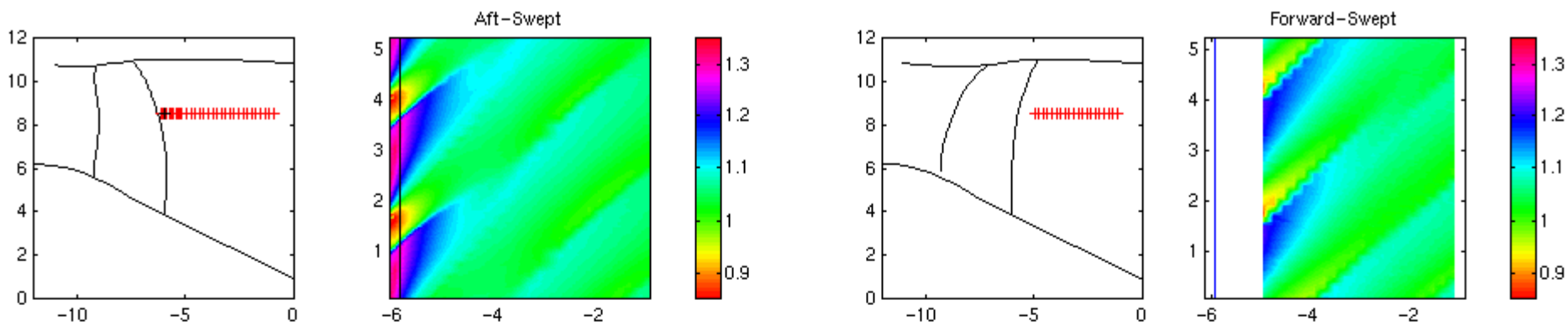


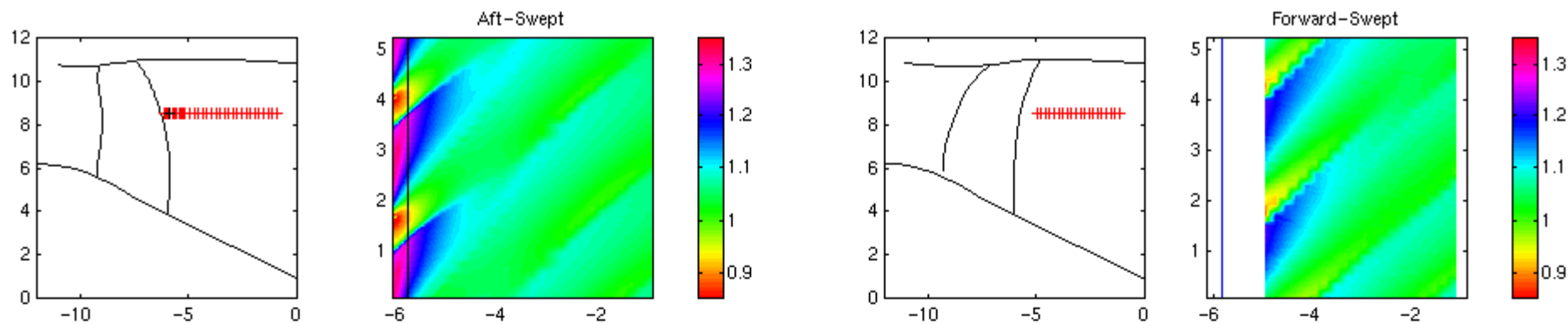
Relative Mach Number Distribution Across Rotor Rev



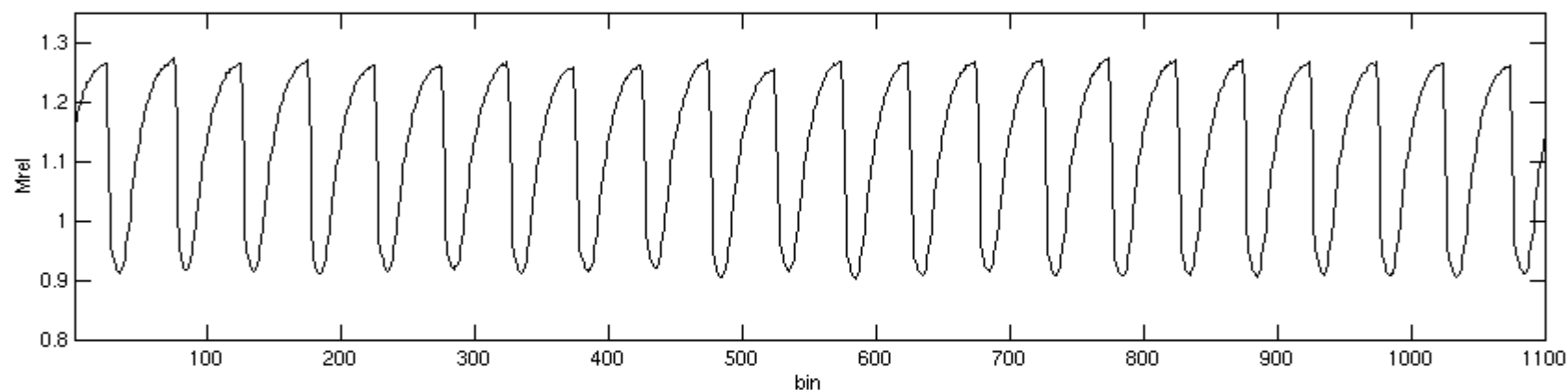
Autospectra of Relative Mach Number Distributions



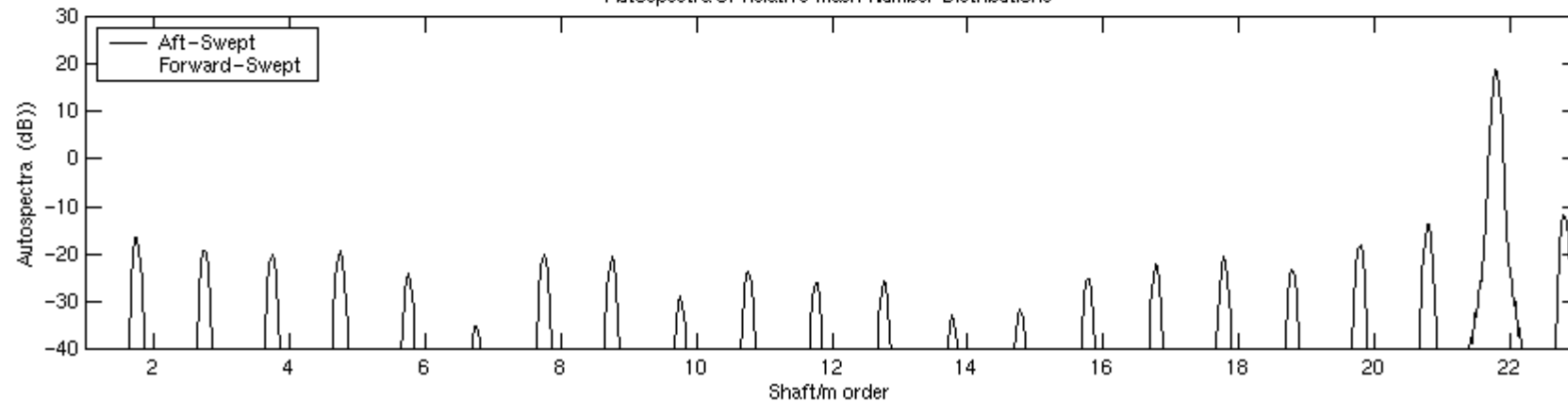


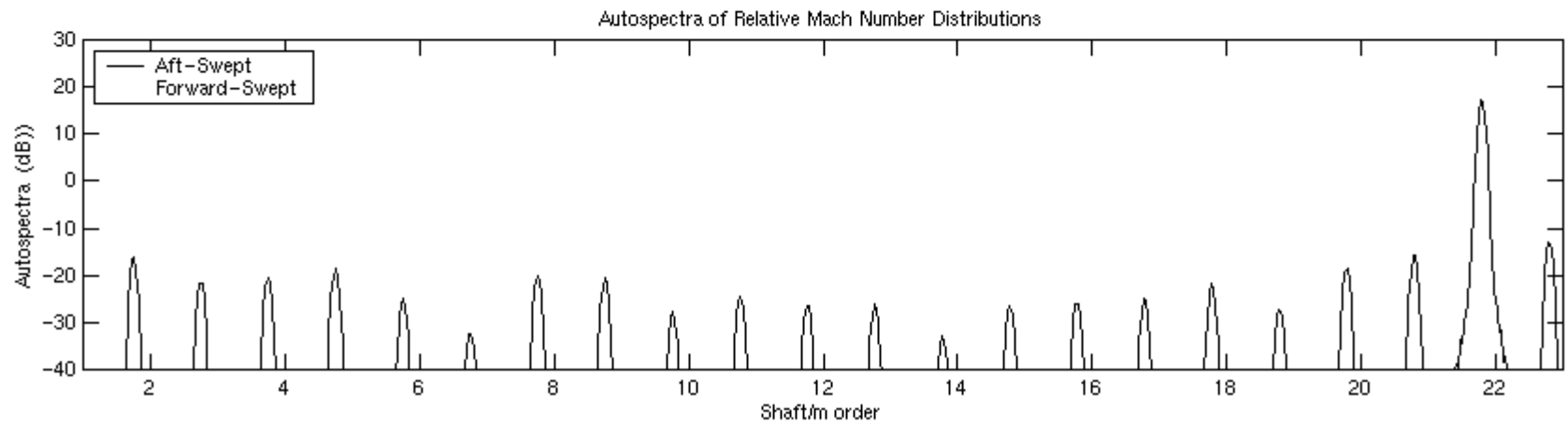
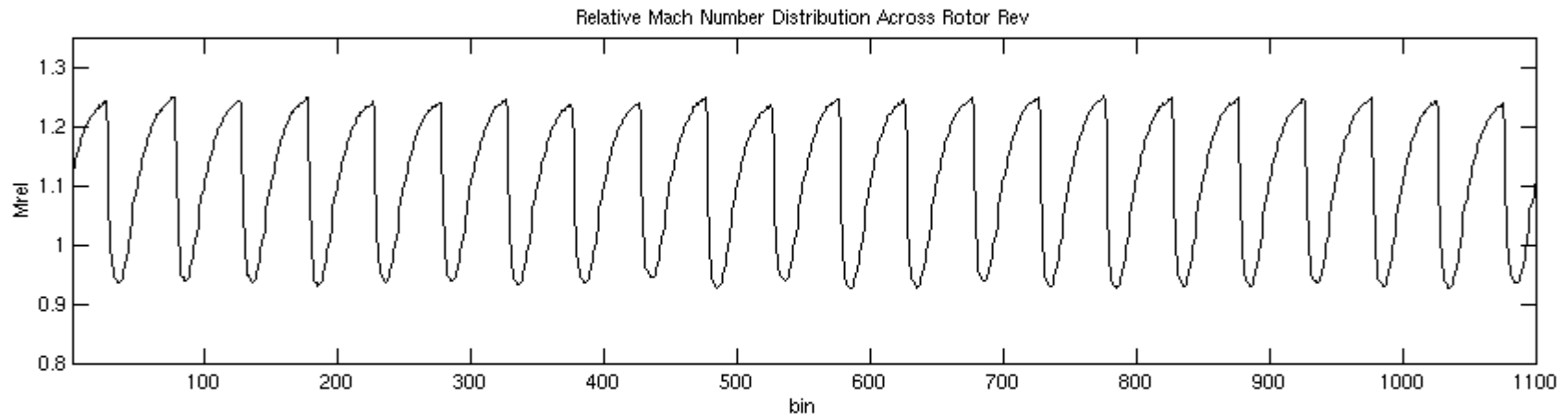
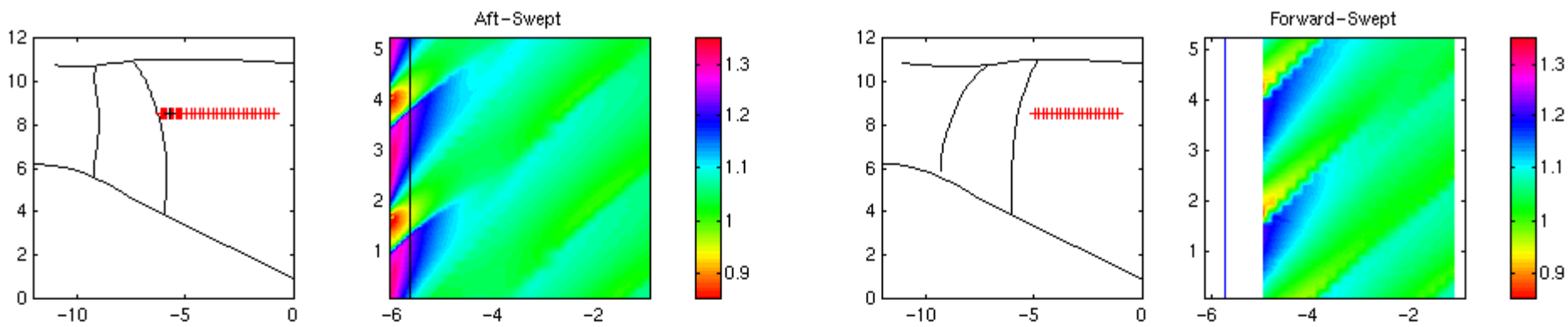


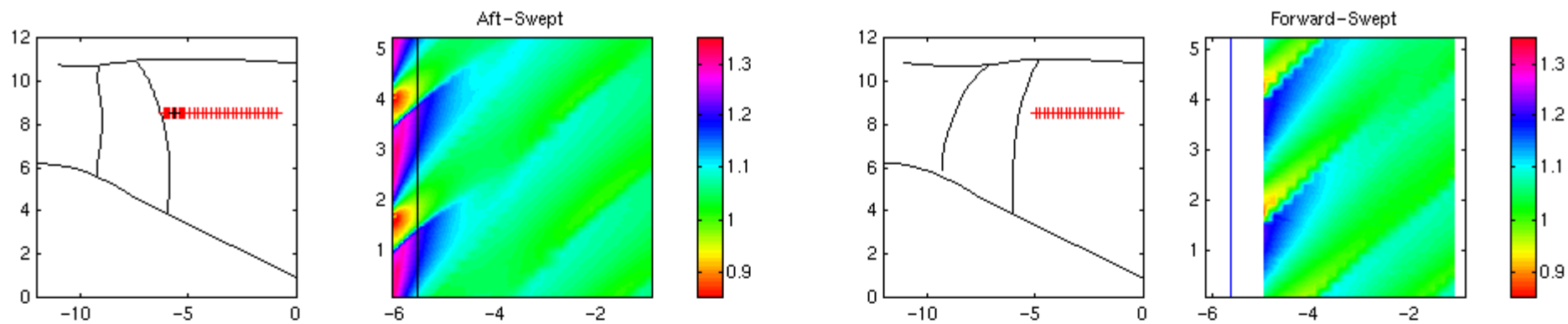
Relative Mach Number Distribution Across Rotor Rev



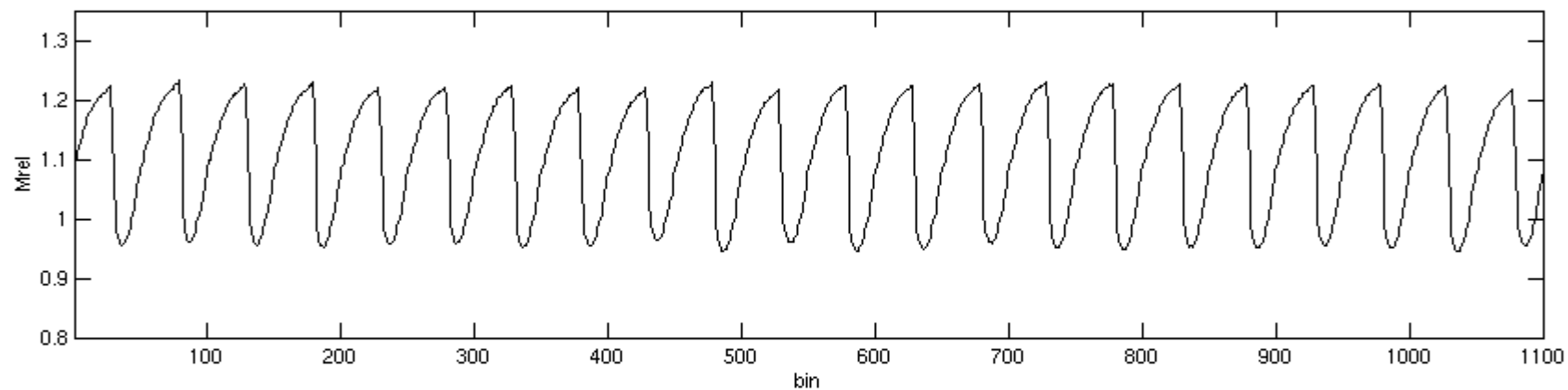
Autospectra of Relative Mach Number Distributions



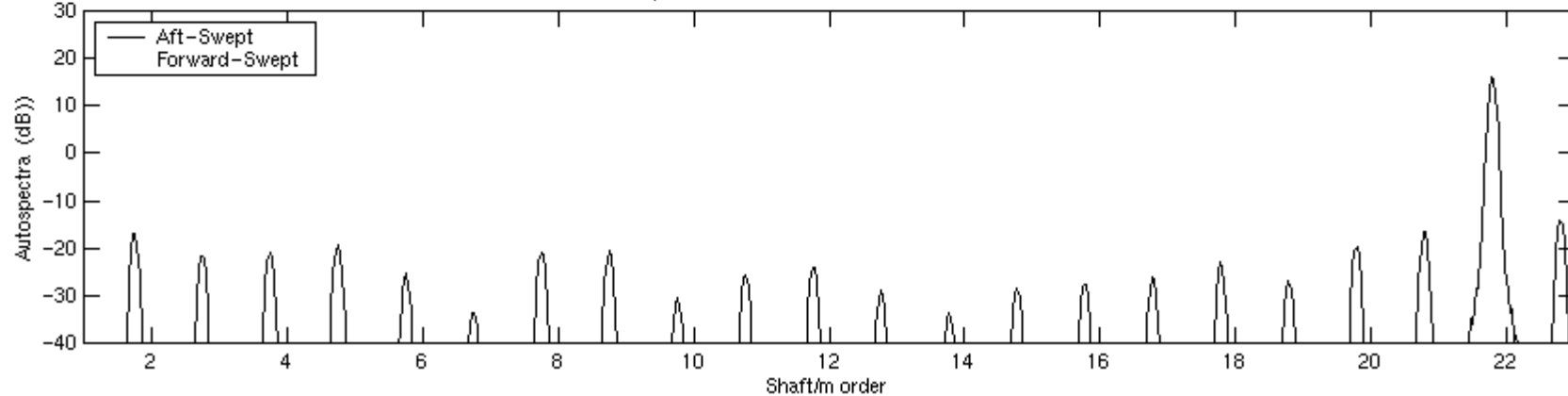


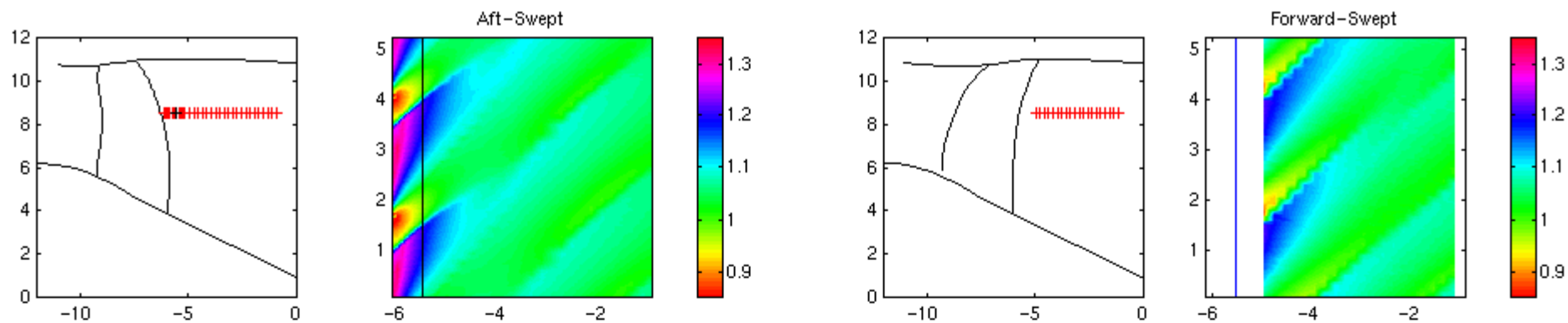


Relative Mach Number Distribution Across Rotor Rev

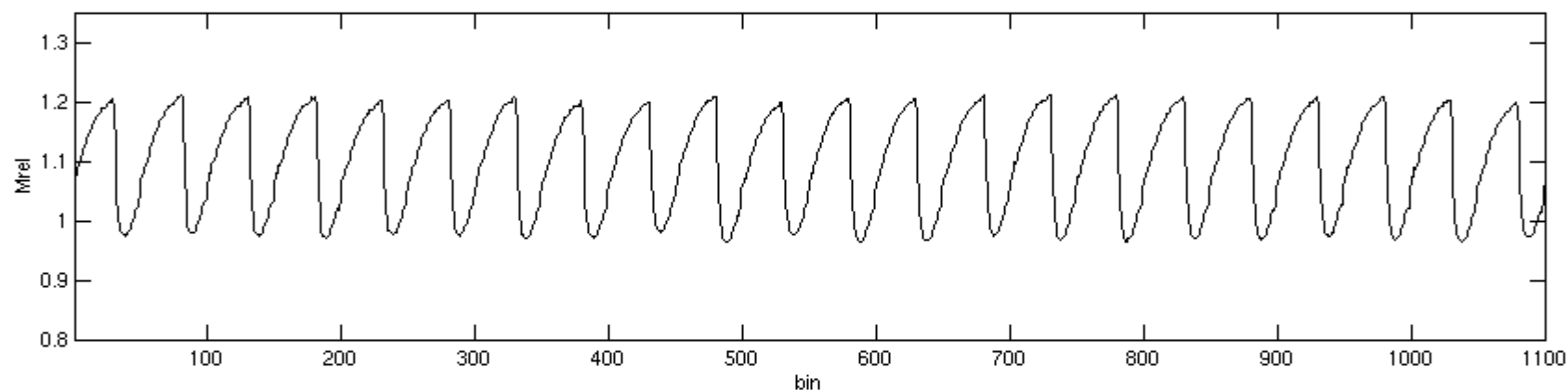


Autospectra of Relative Mach Number Distributions

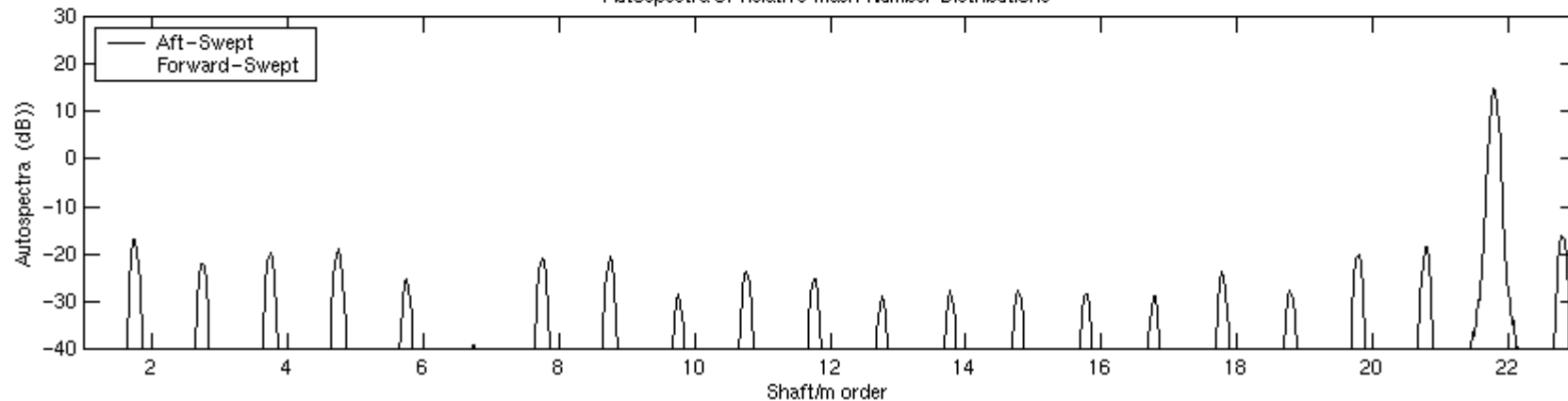


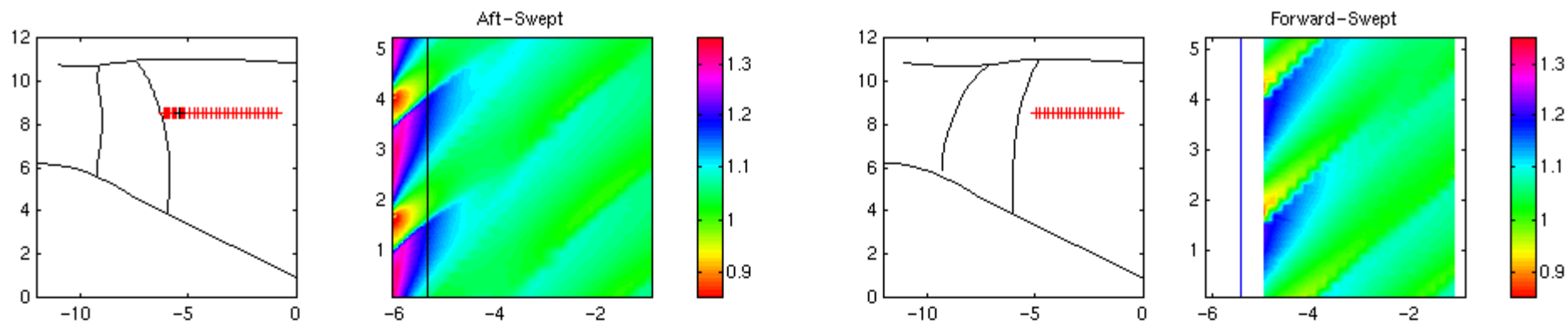


Relative Mach Number Distribution Across Rotor Rev

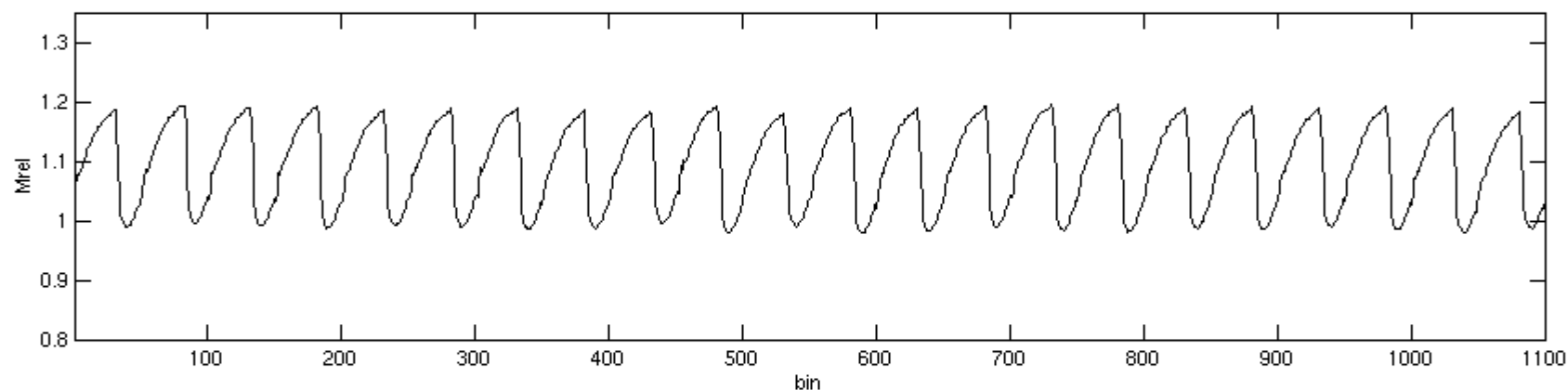


Autospectra of Relative Mach Number Distributions

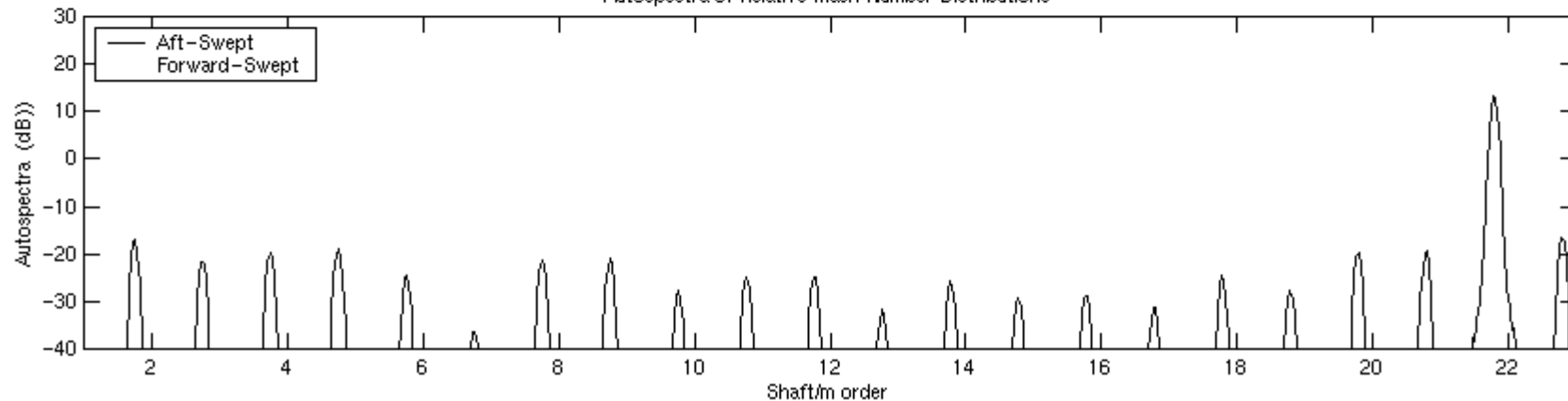


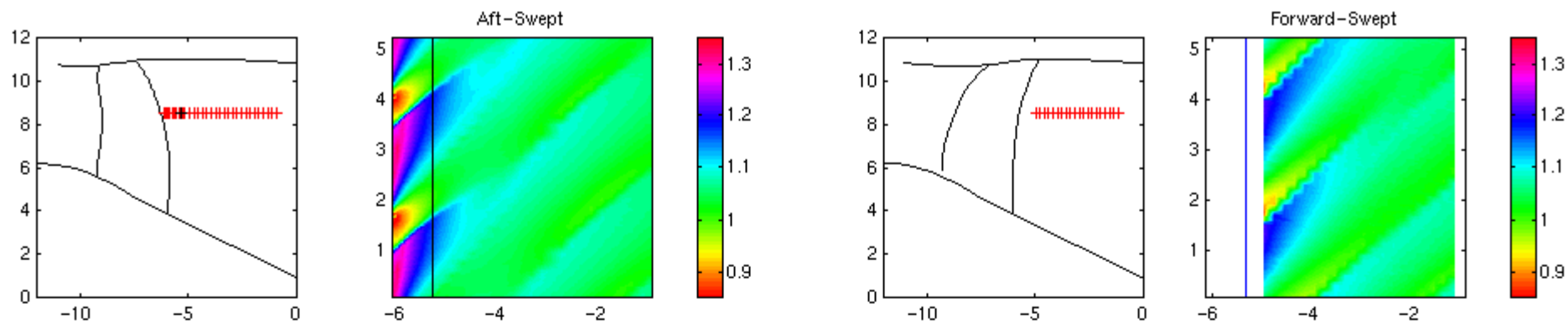


Relative Mach Number Distribution Across Rotor Rev

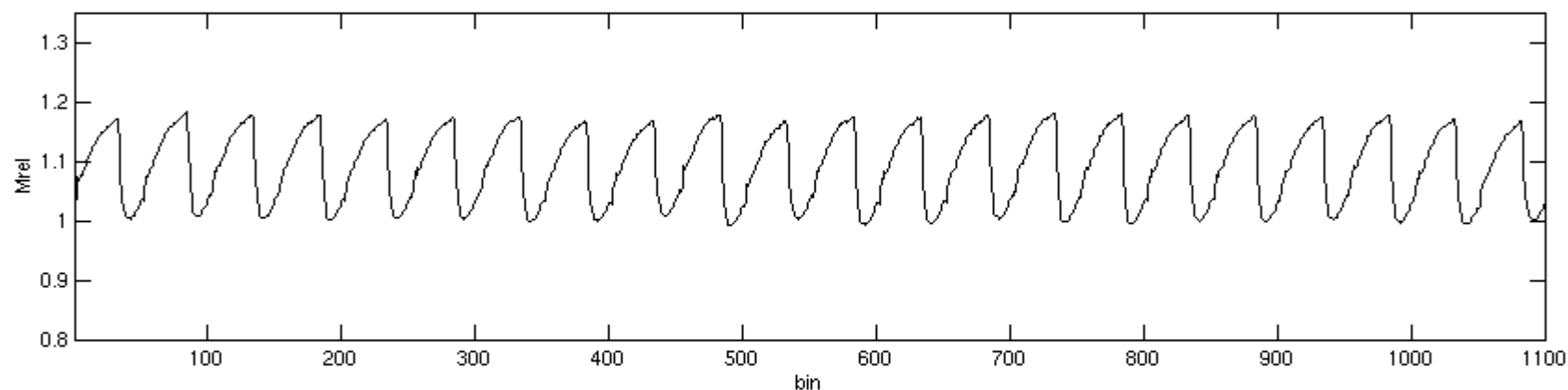


Autospectra of Relative Mach Number Distributions

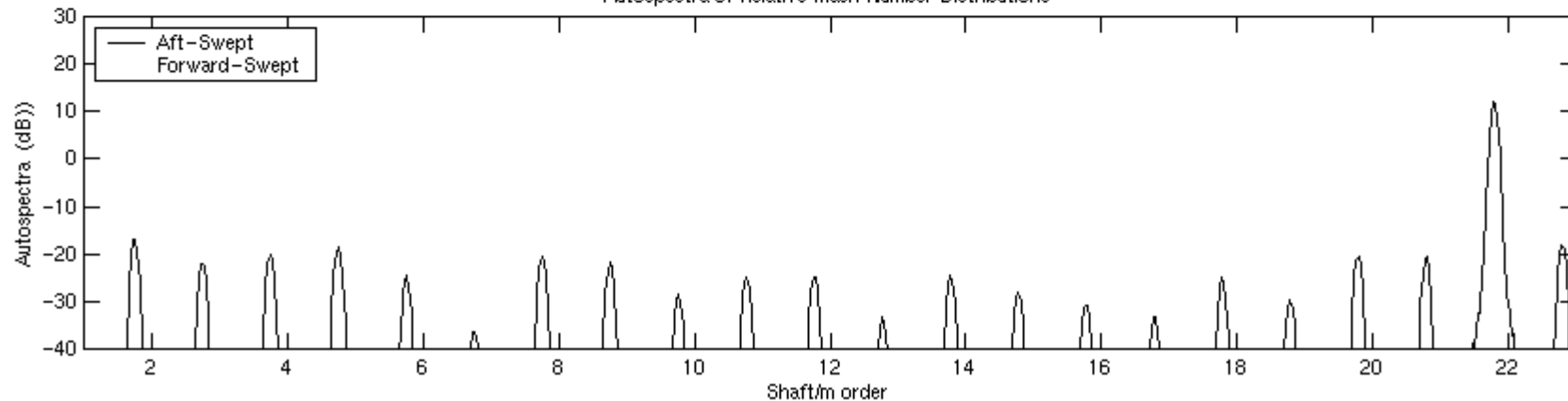


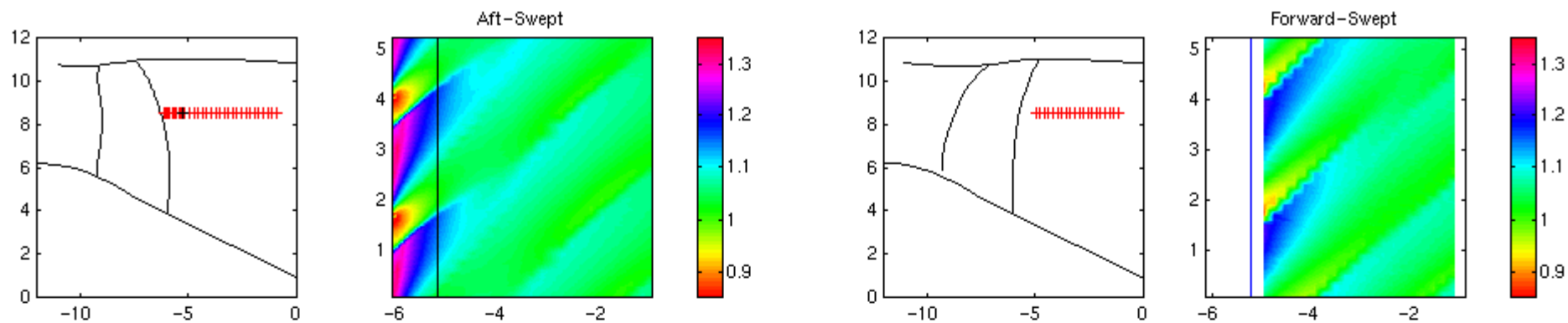


Relative Mach Number Distribution Across Rotor Rev

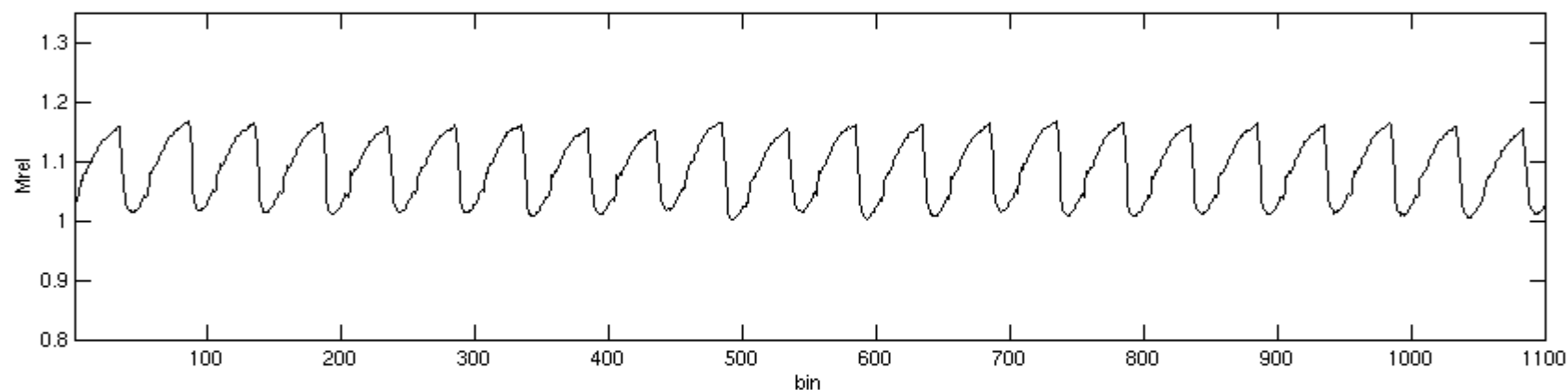


Autospectra of Relative Mach Number Distributions

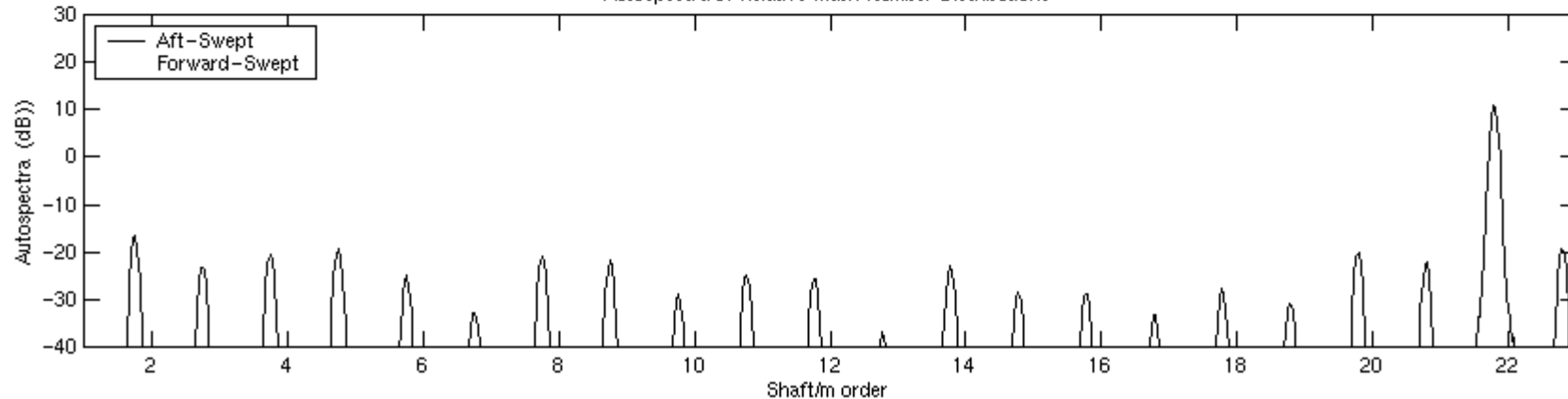


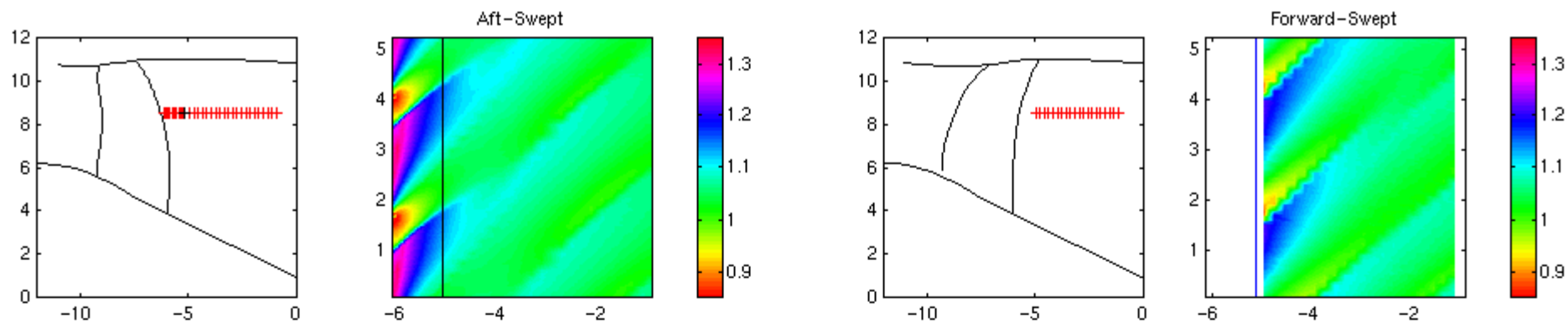


Relative Mach Number Distribution Across Rotor Rev

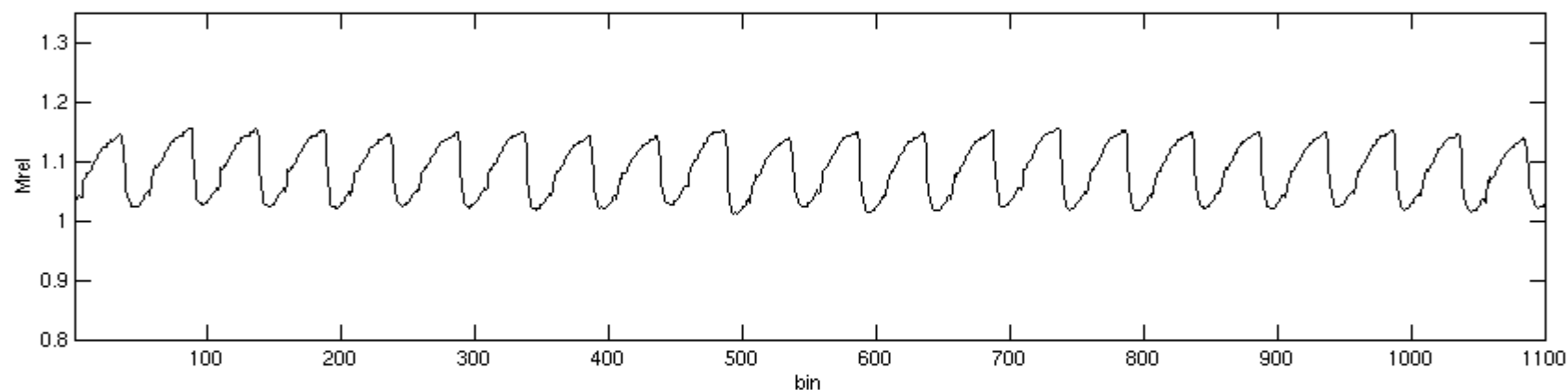


Autospectra of Relative Mach Number Distributions

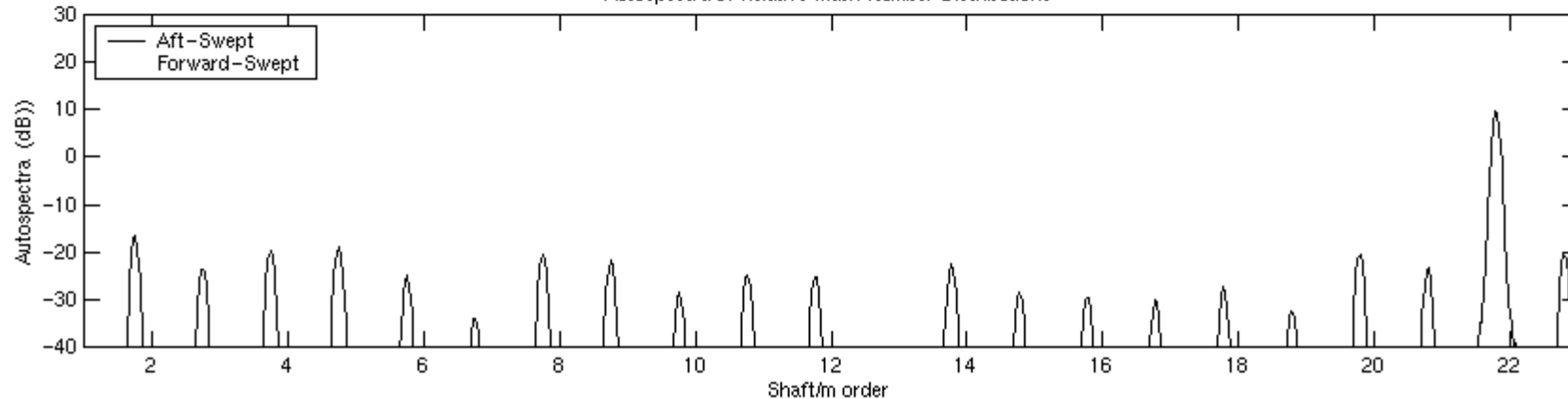


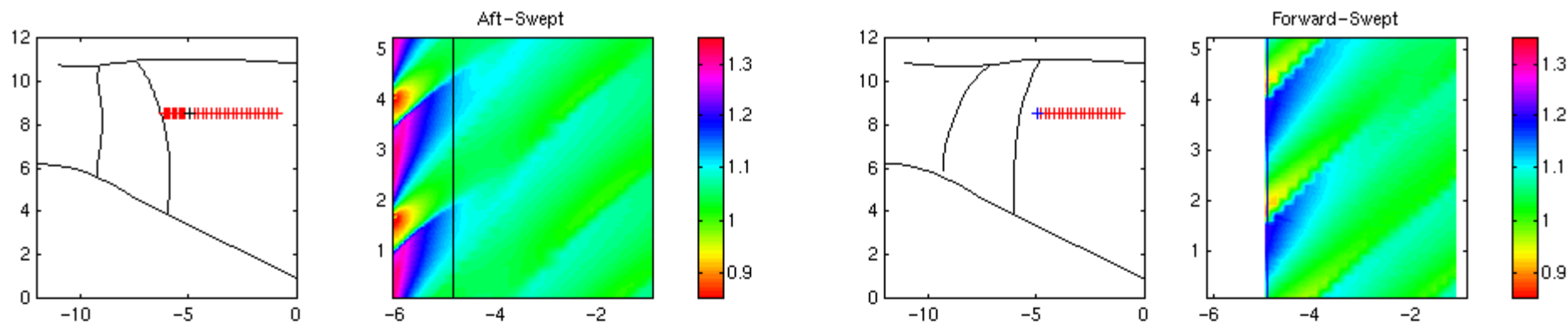


Relative Mach Number Distribution Across Rotor Rev

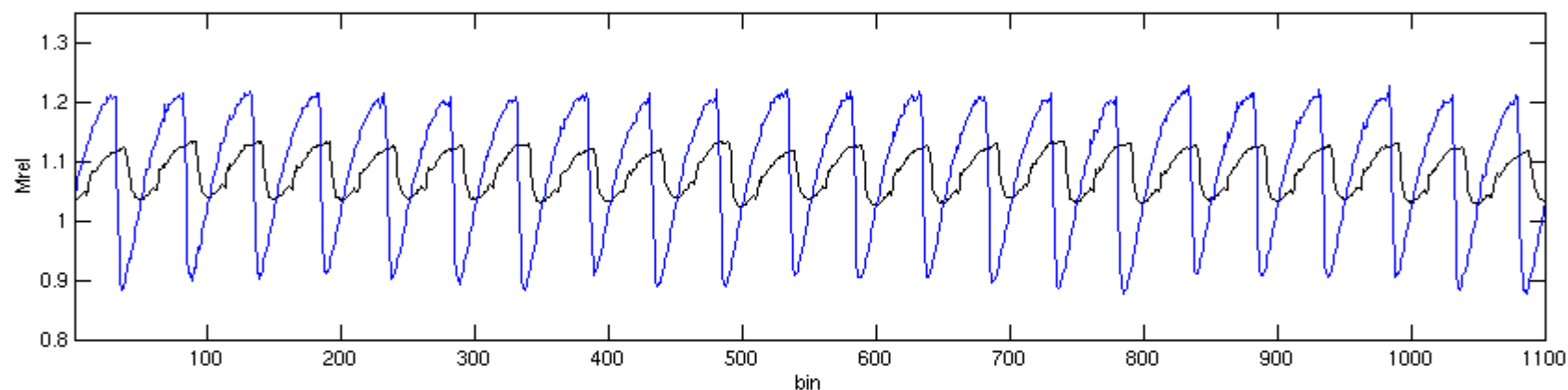


Autospectra of Relative Mach Number Distributions

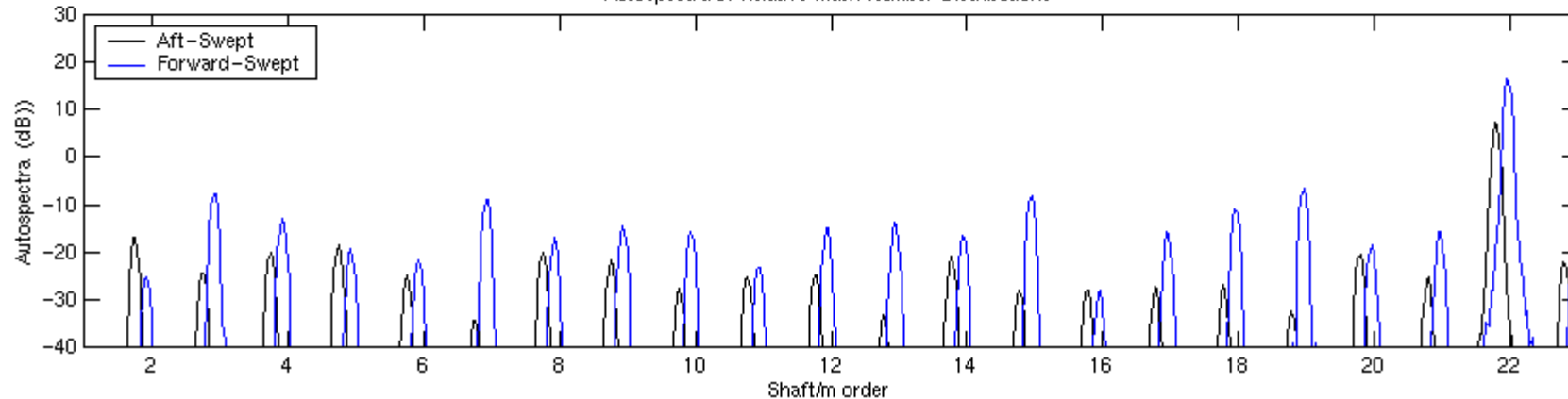


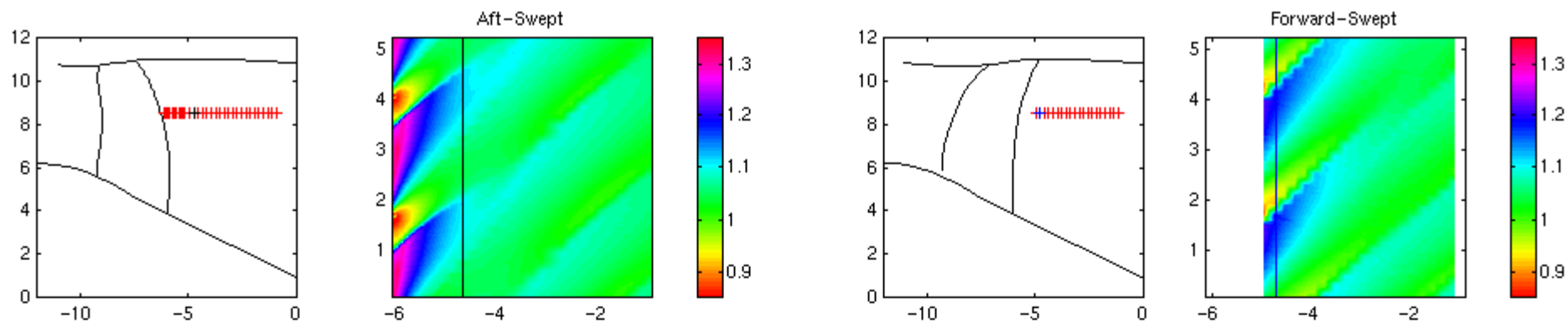


Relative Mach Number Distribution Across Rotor Rev

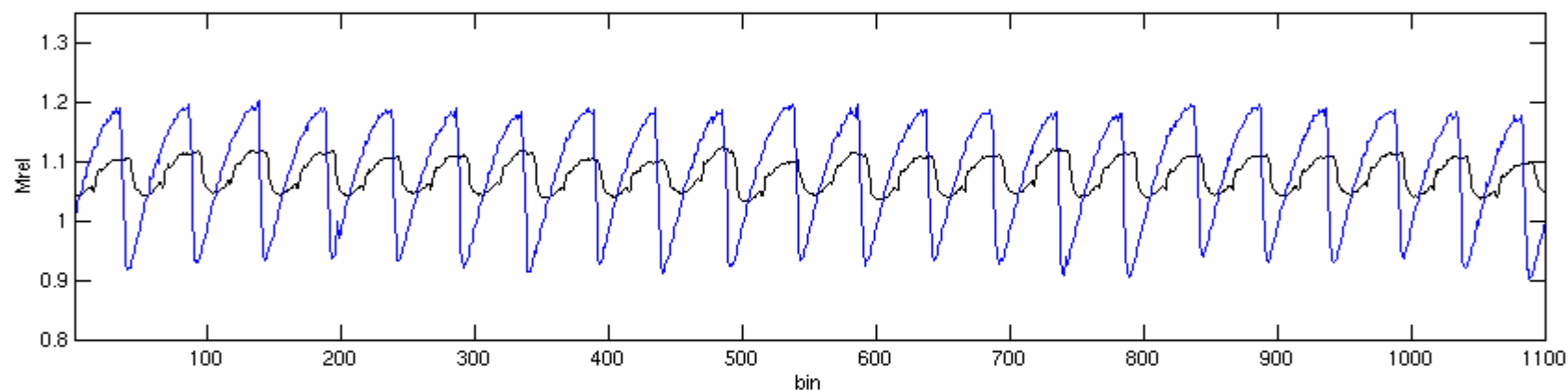


Autospectra of Relative Mach Number Distributions

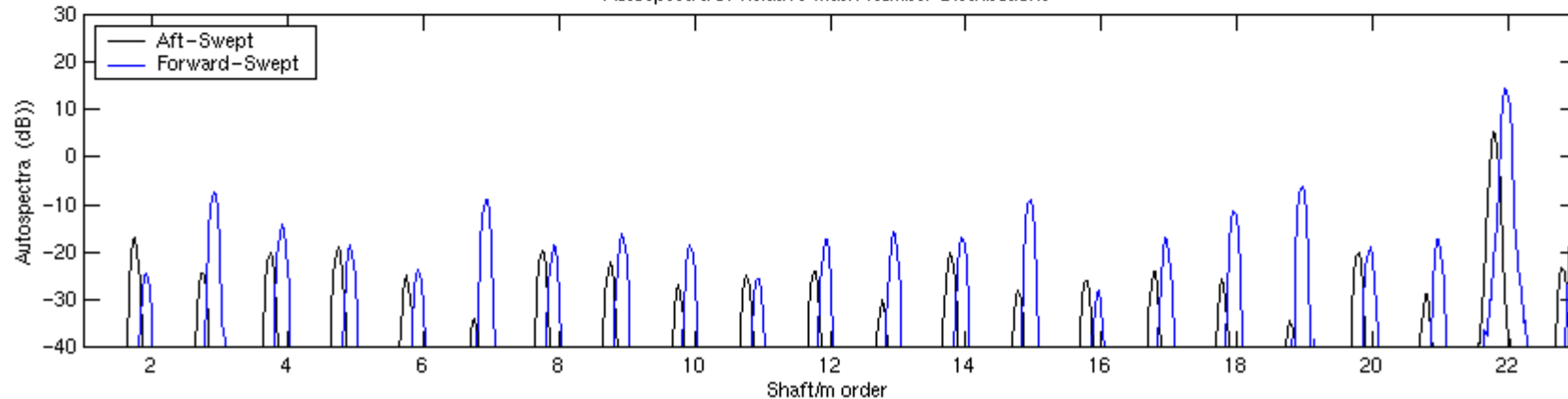


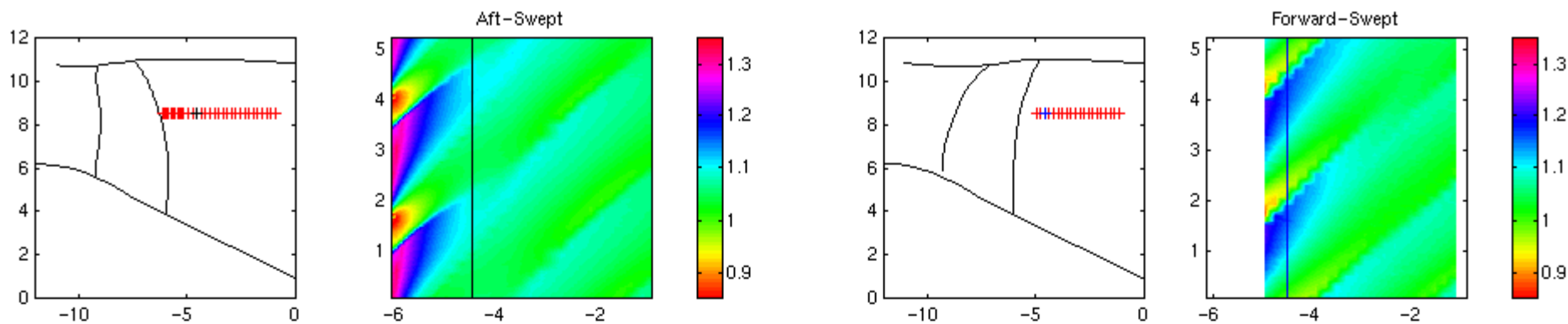


Relative Mach Number Distribution Across Rotor Rev

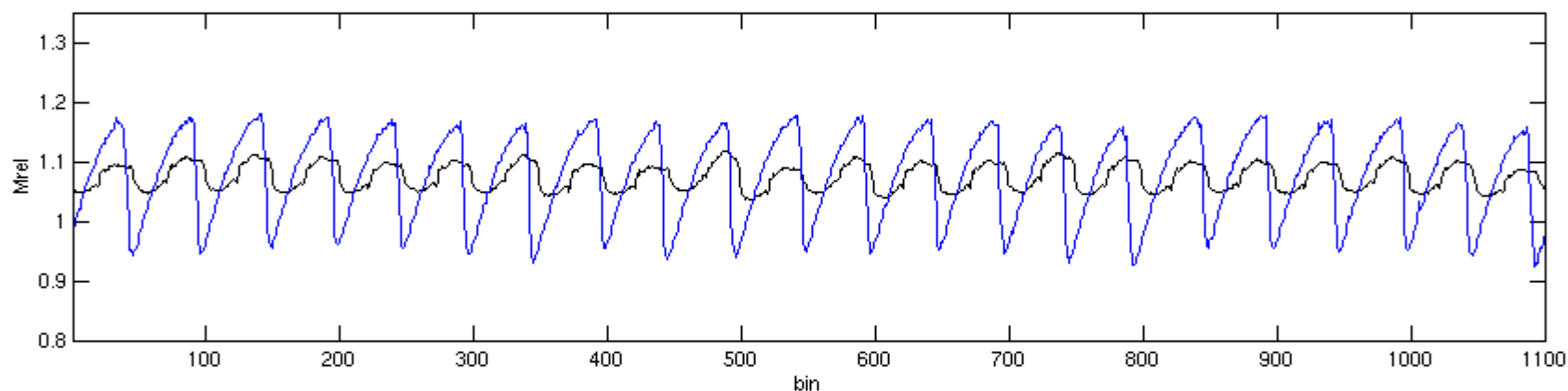


Autospectra of Relative Mach Number Distributions

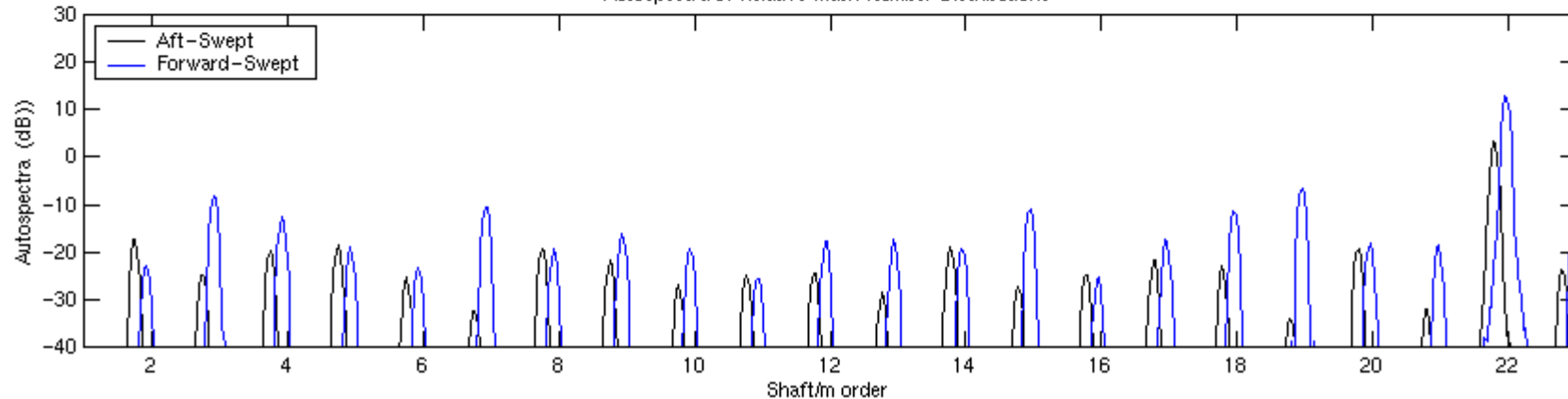


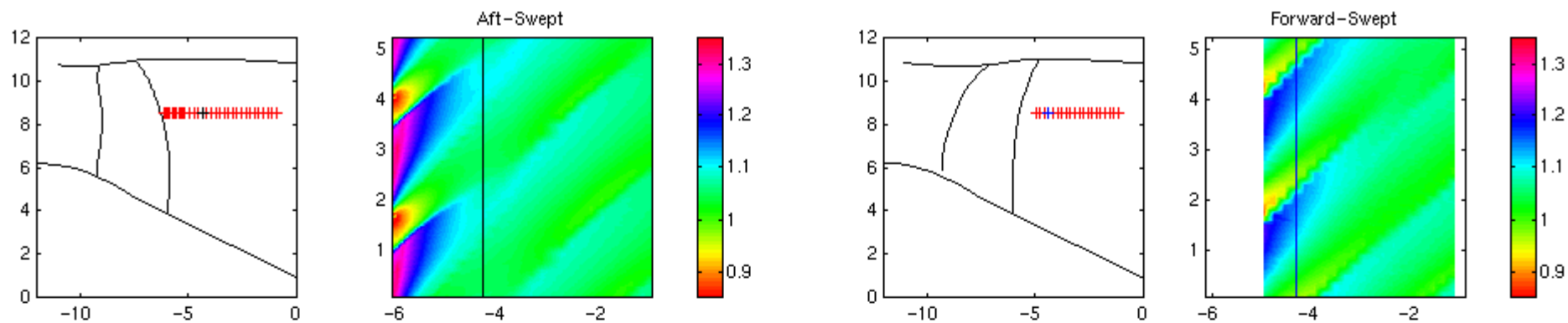


Relative Mach Number Distribution Across Rotor Rev

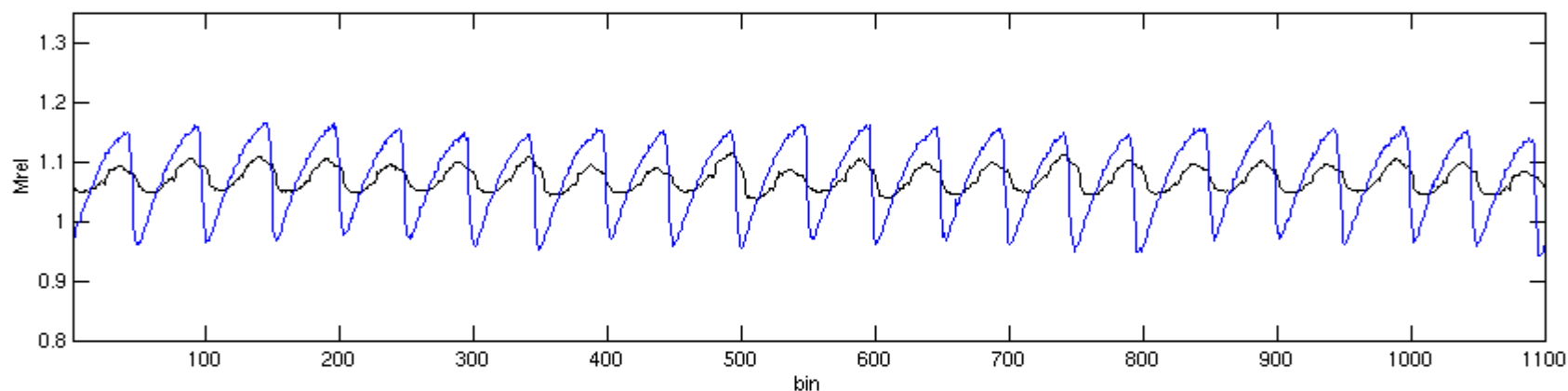


Autospectra of Relative Mach Number Distributions

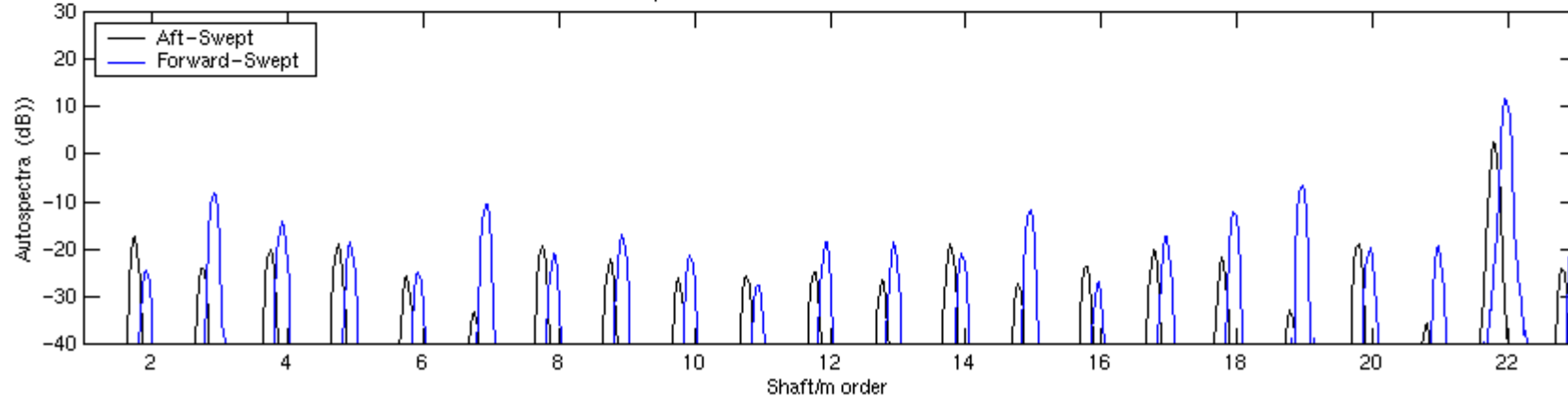


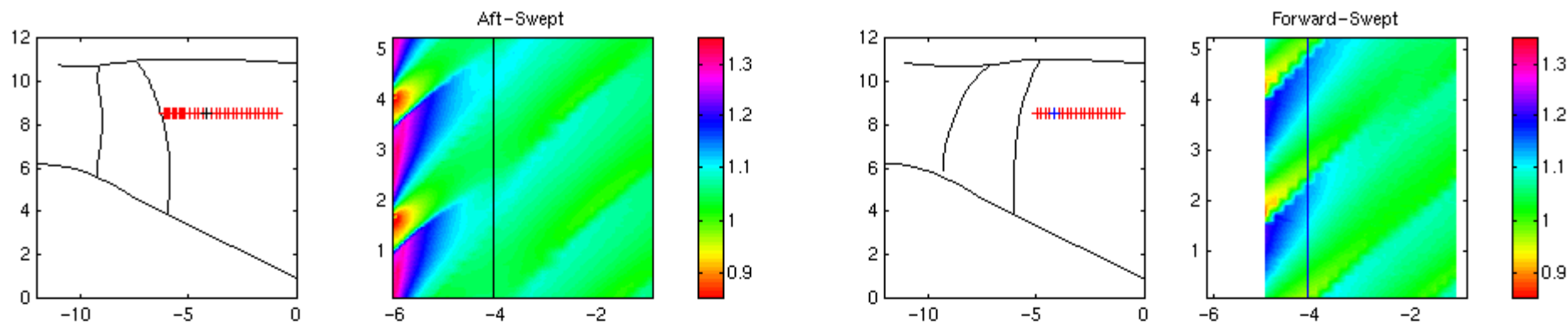


Relative Mach Number Distribution Across Rotor Rev

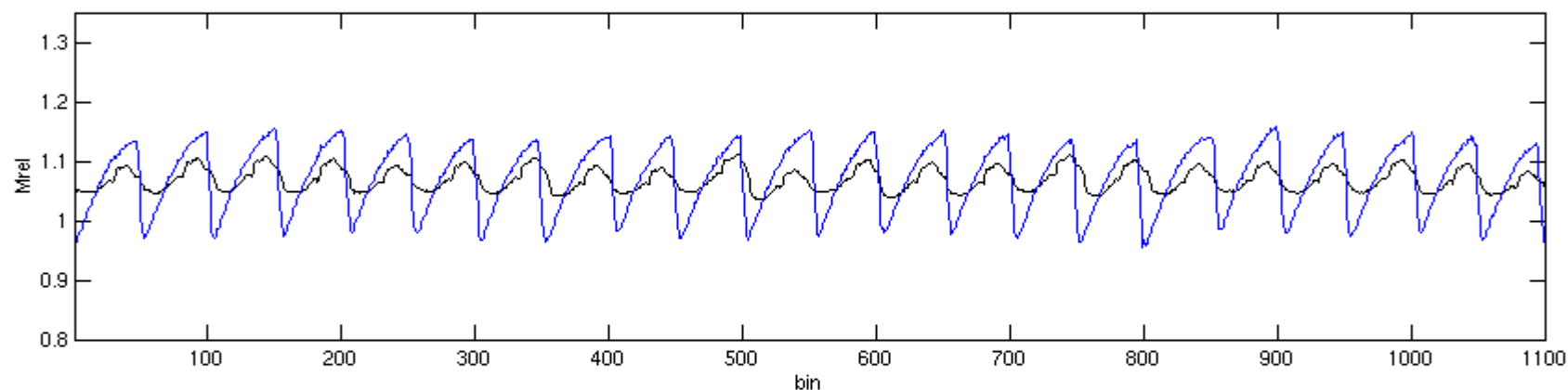


Autospectra of Relative Mach Number Distributions

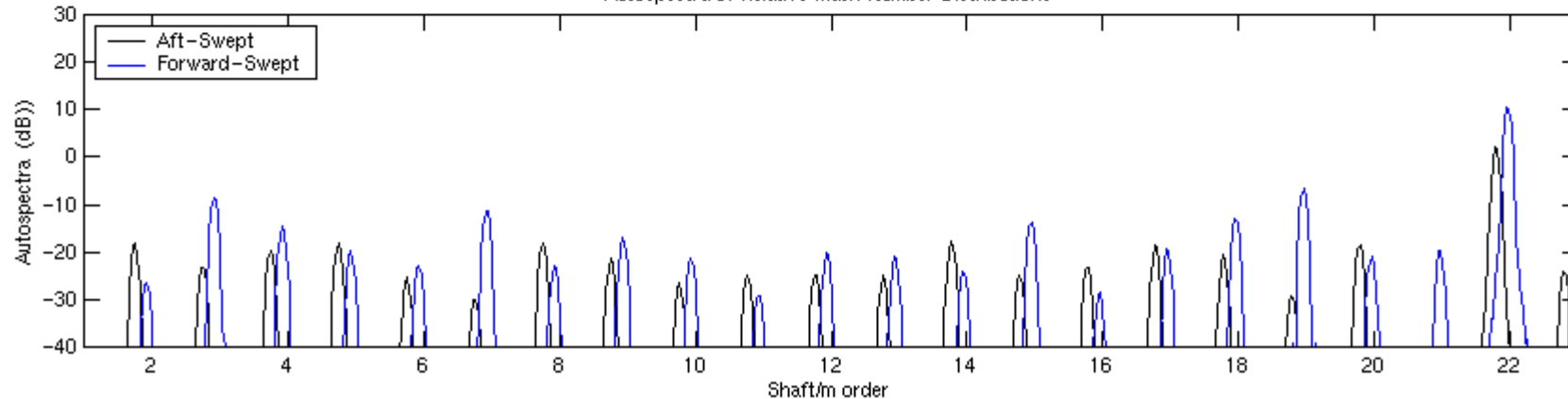


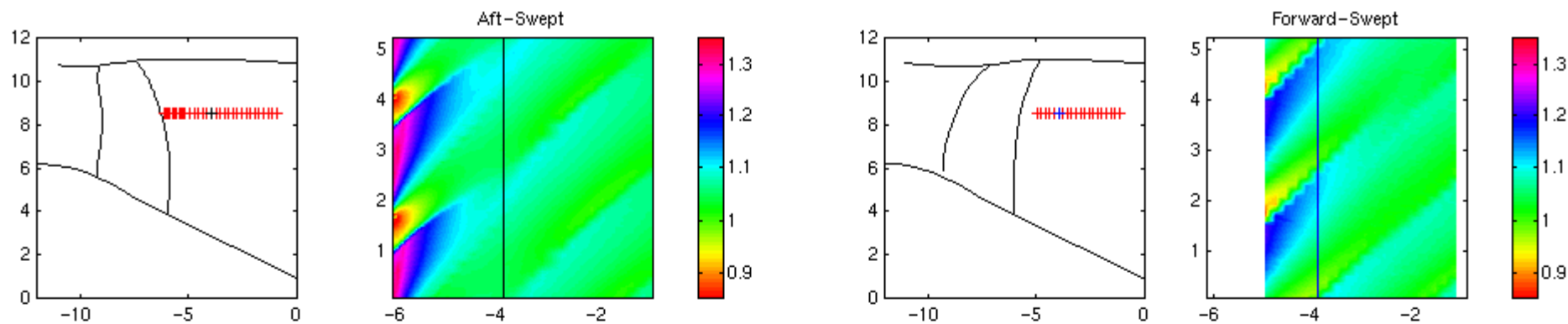


Relative Mach Number Distribution Across Rotor Rev

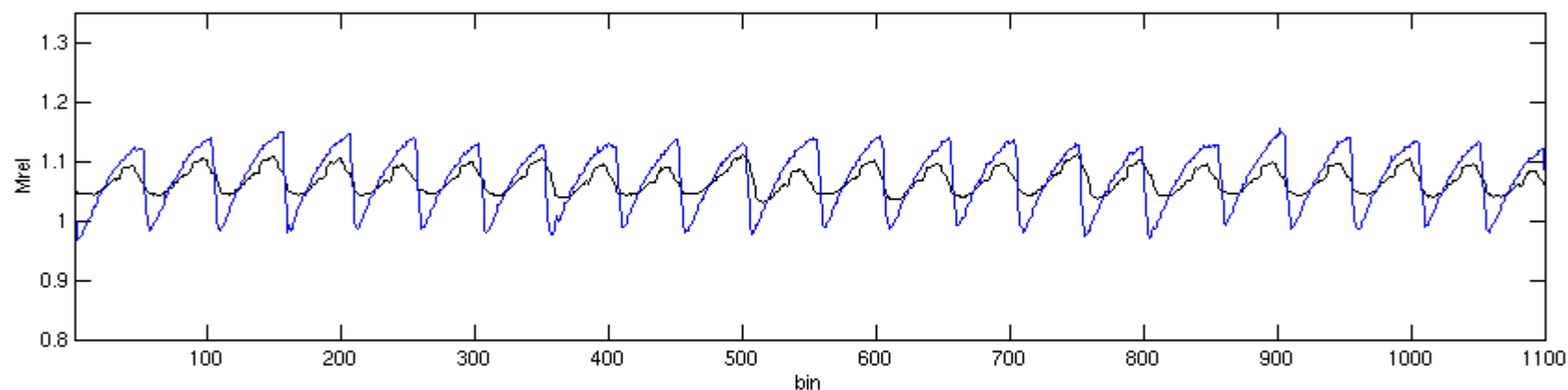


Autospectra of Relative Mach Number Distributions

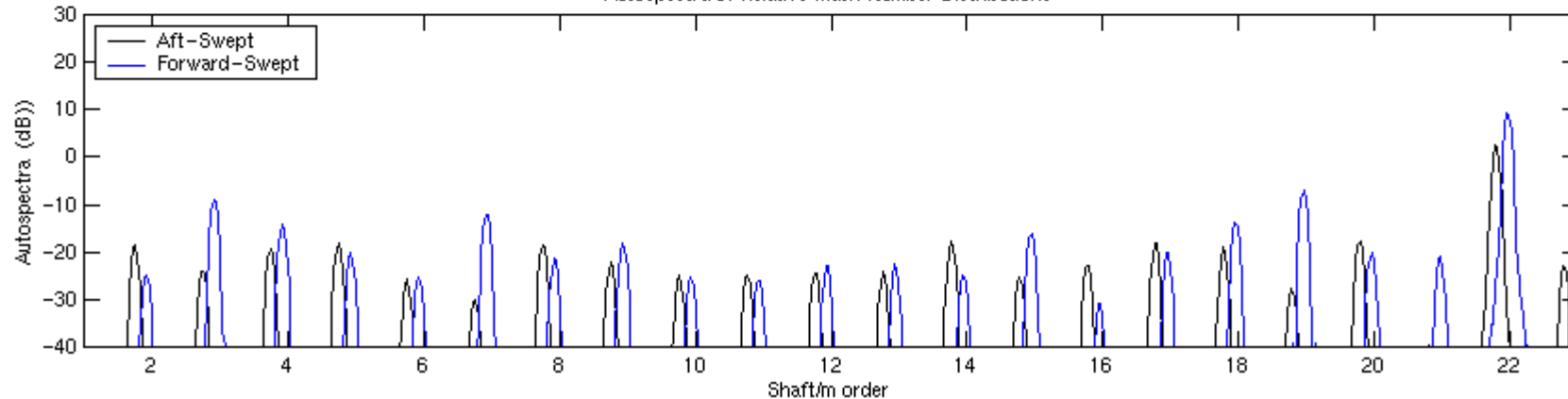


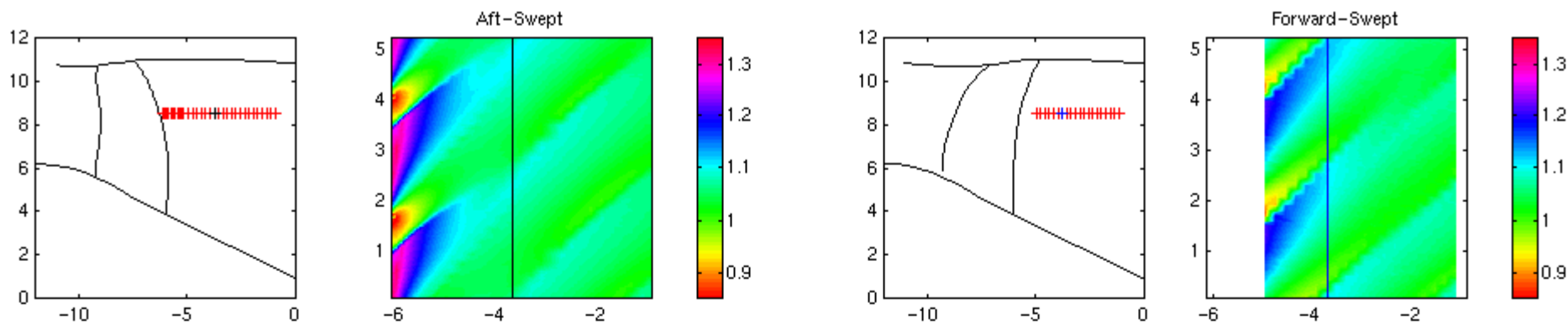


Relative Mach Number Distribution Across Rotor Rev

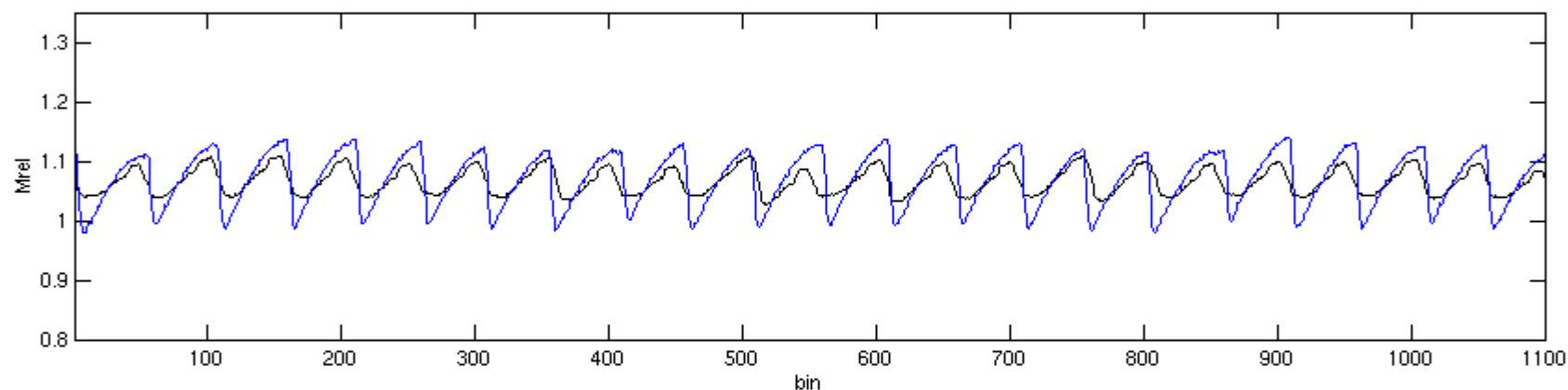


Autospectra of Relative Mach Number Distributions

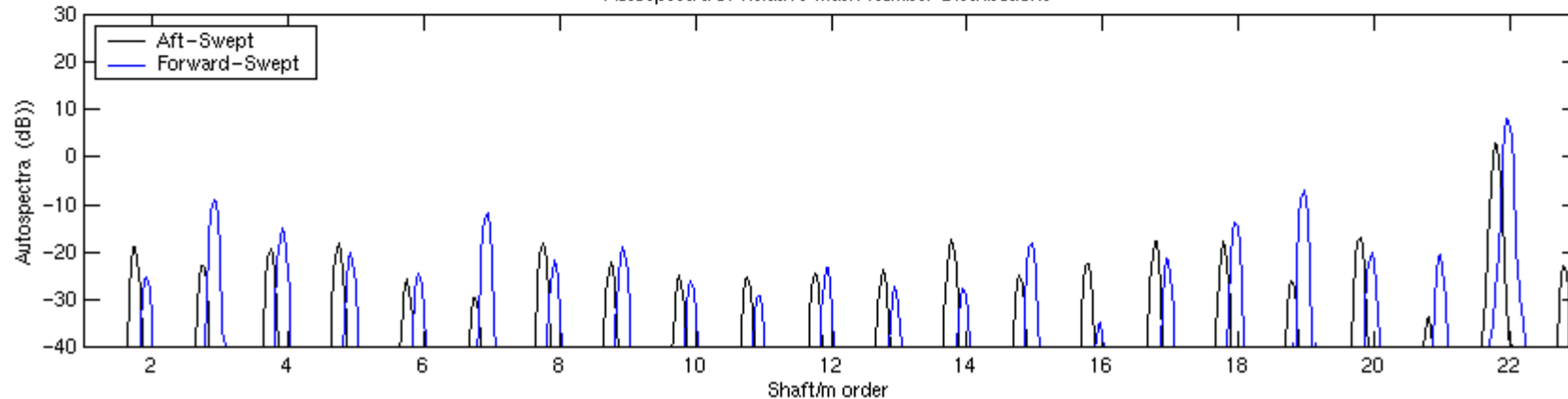


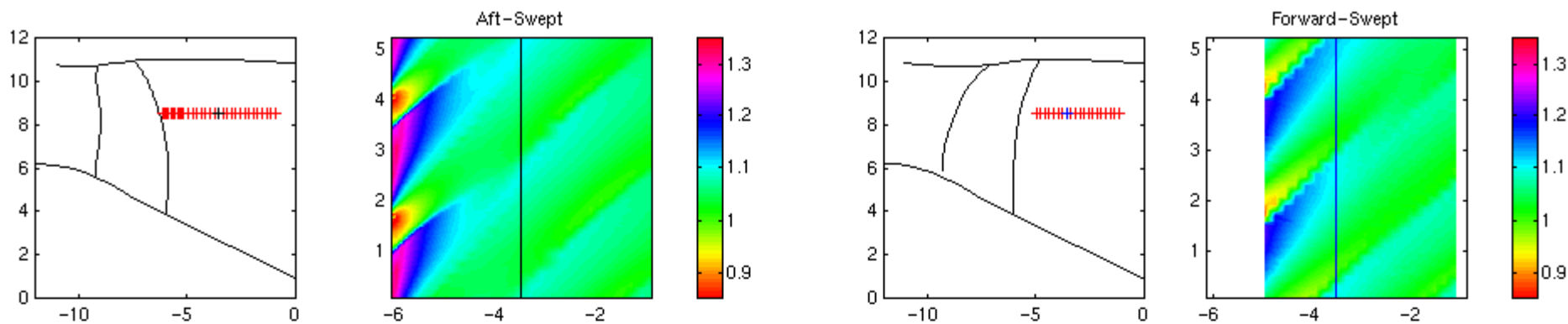


Relative Mach Number Distribution Across Rotor Rev

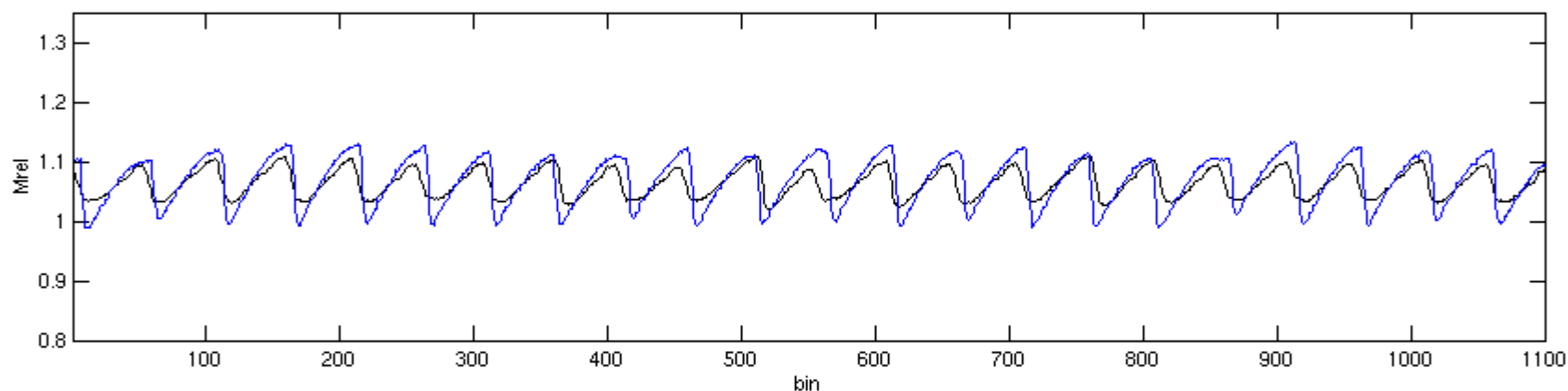


Autospectra of Relative Mach Number Distributions

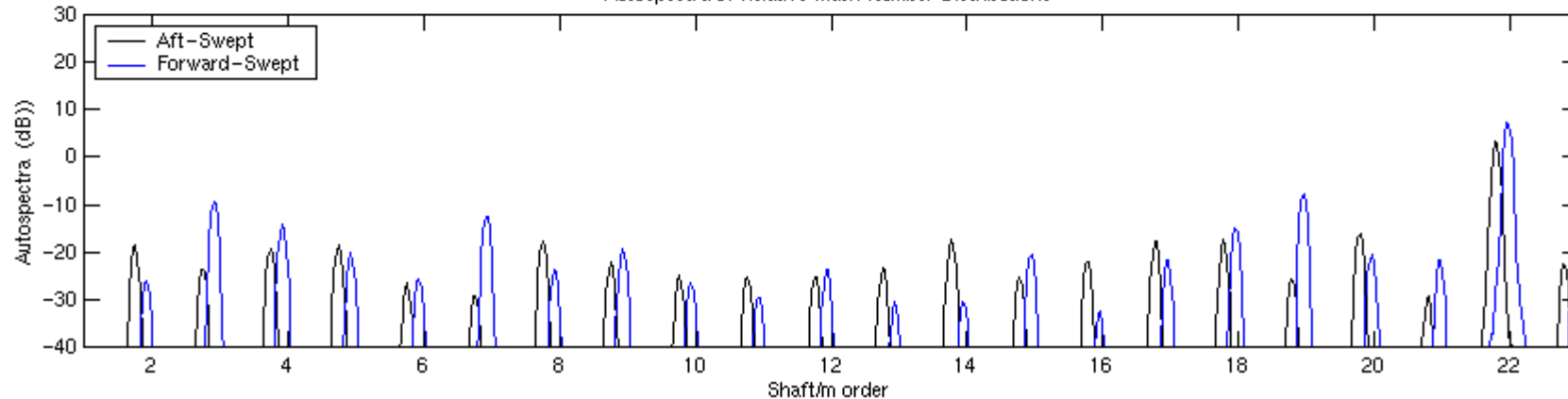


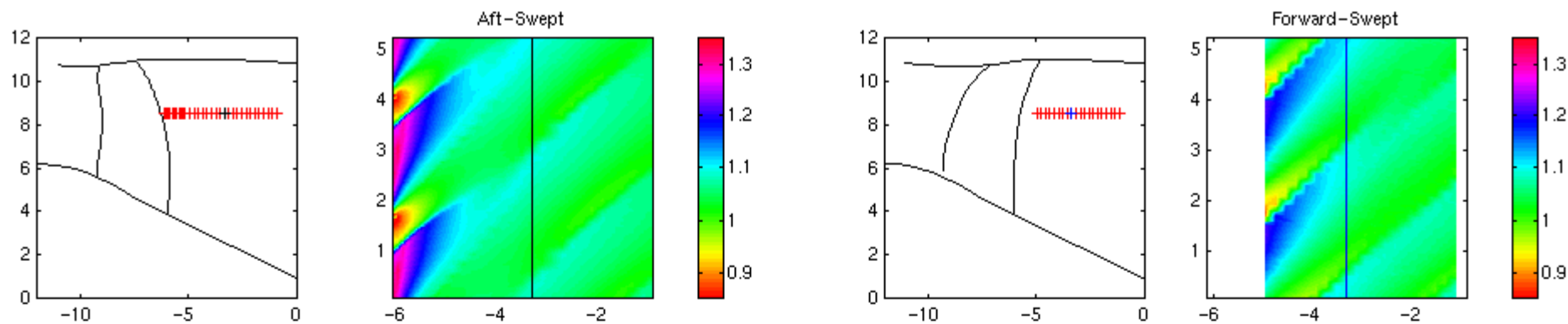


Relative Mach Number Distribution Across Rotor Rev

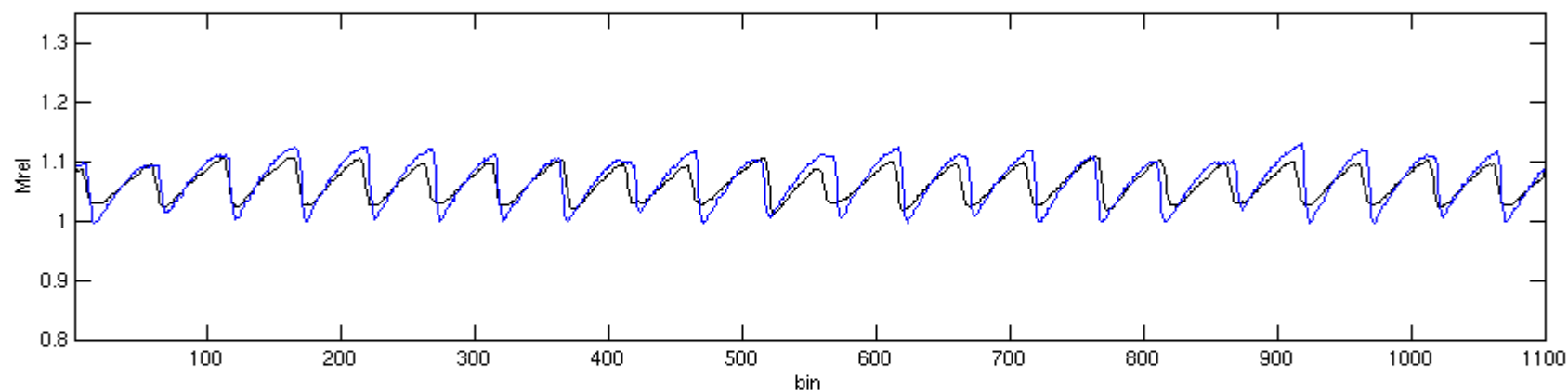


Autospectra of Relative Mach Number Distributions

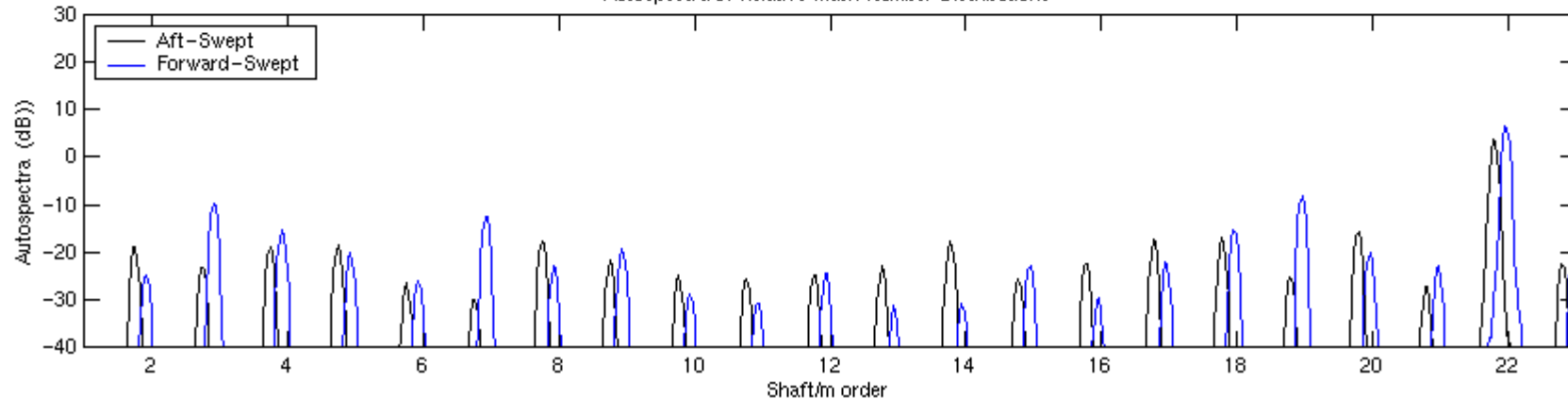


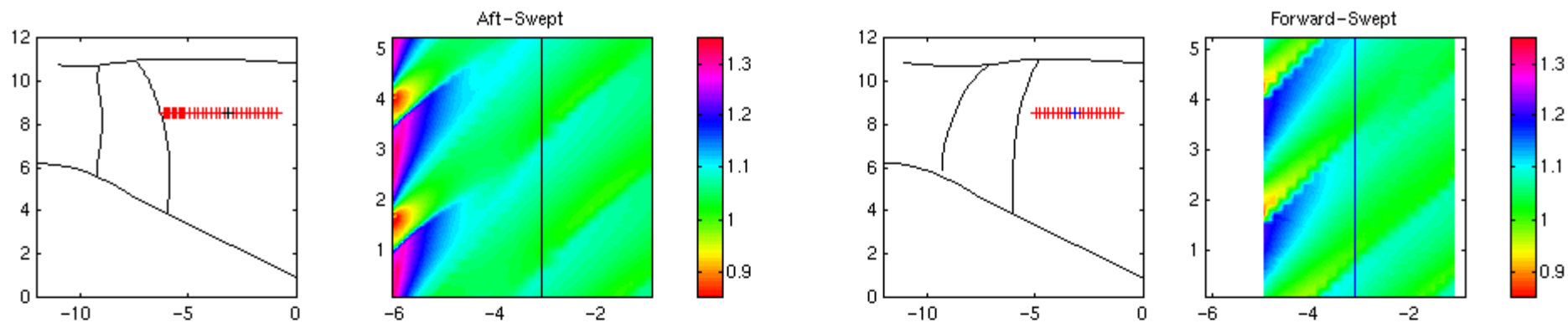


Relative Mach Number Distribution Across Rotor Rev

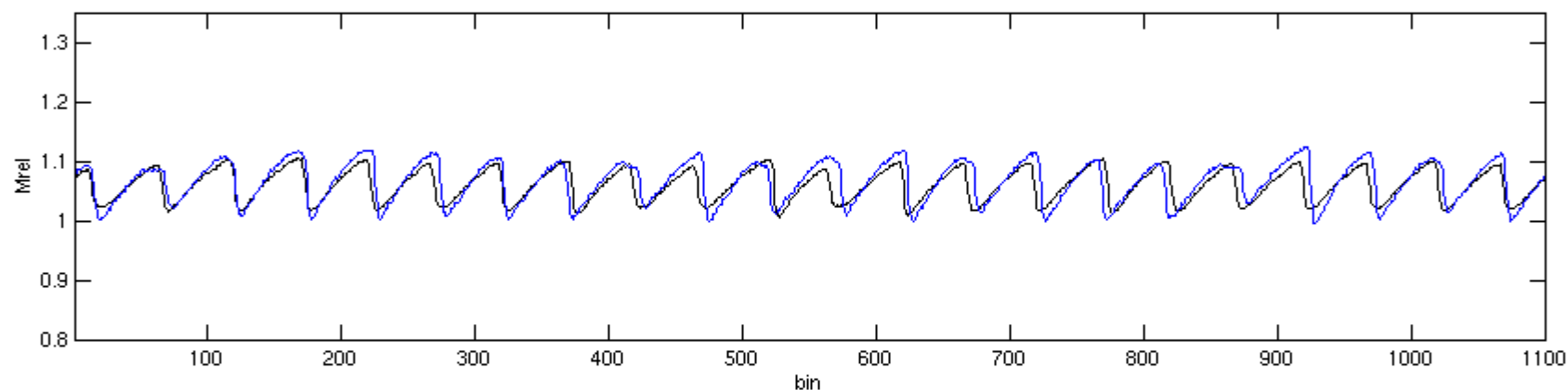


Autospectra of Relative Mach Number Distributions

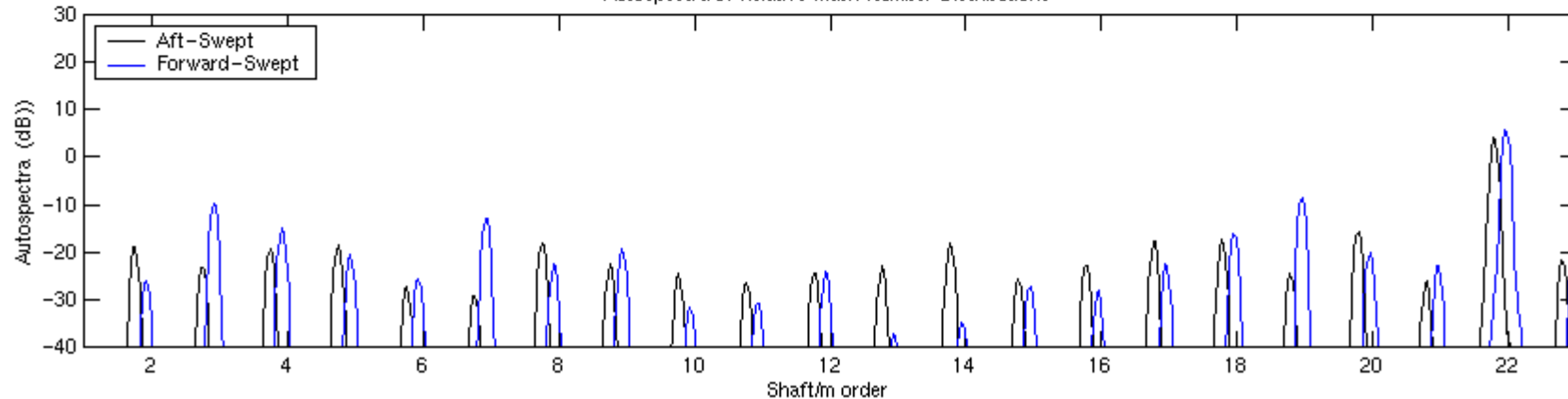


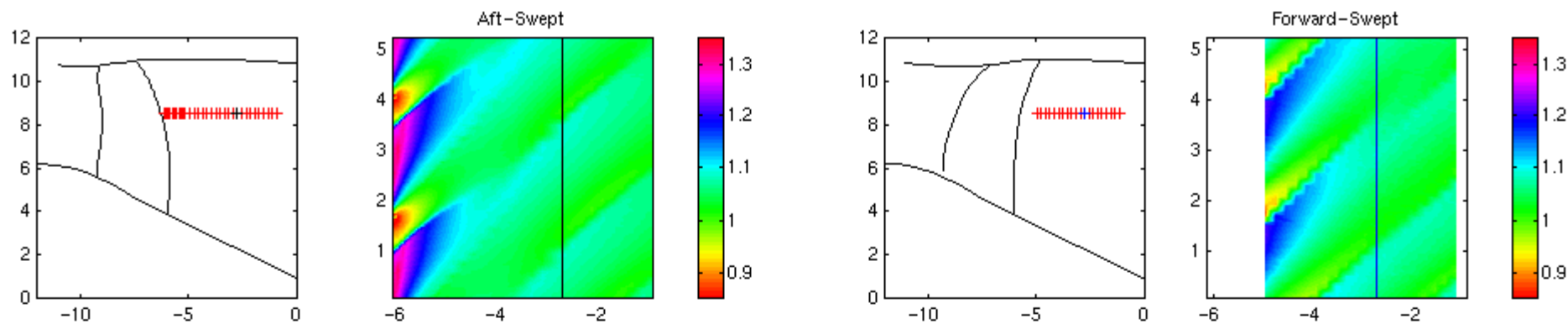


Relative Mach Number Distribution Across Rotor Rev

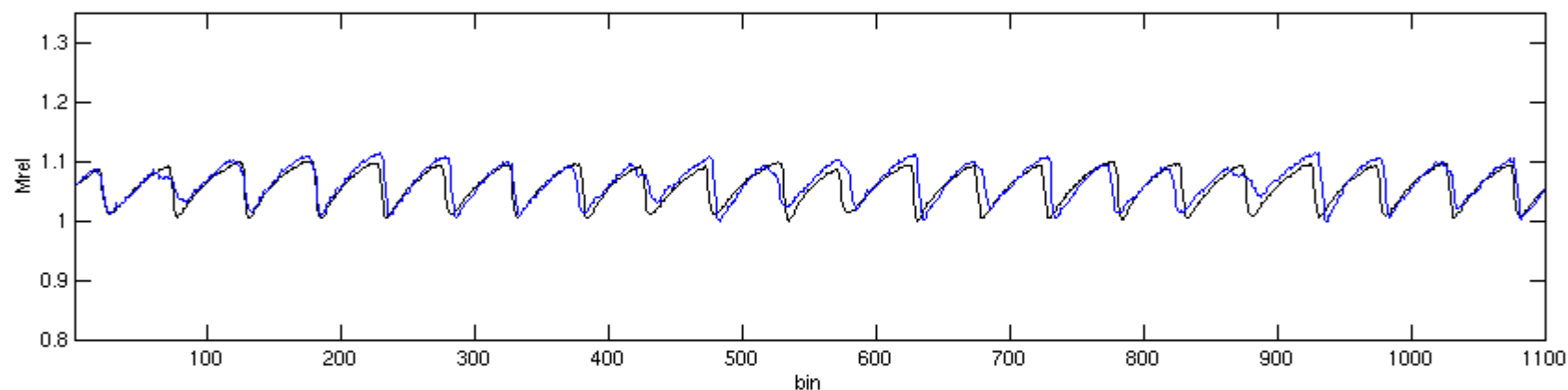


Autospectra of Relative Mach Number Distributions

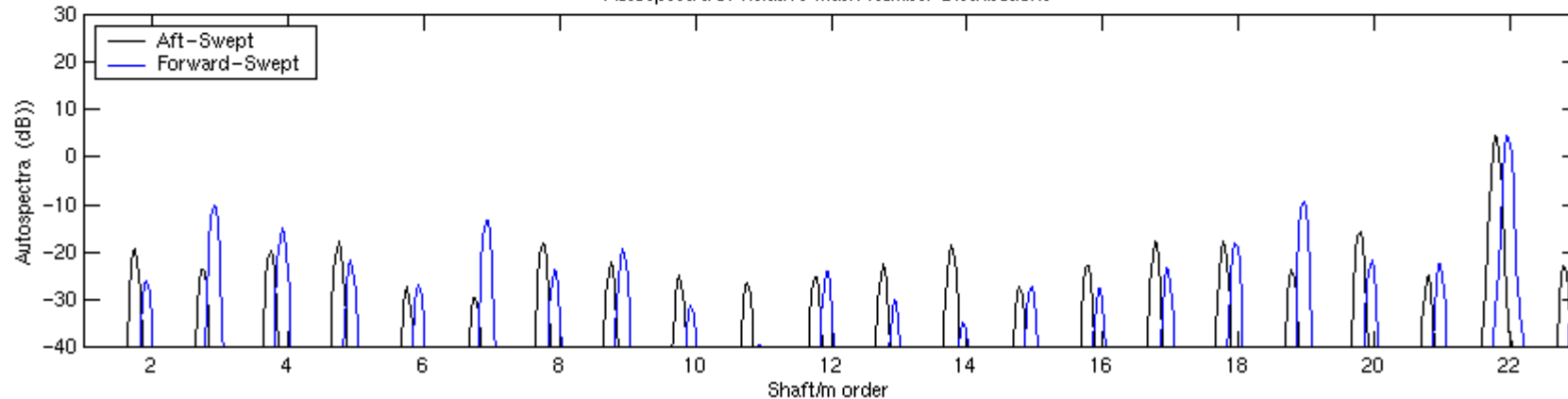


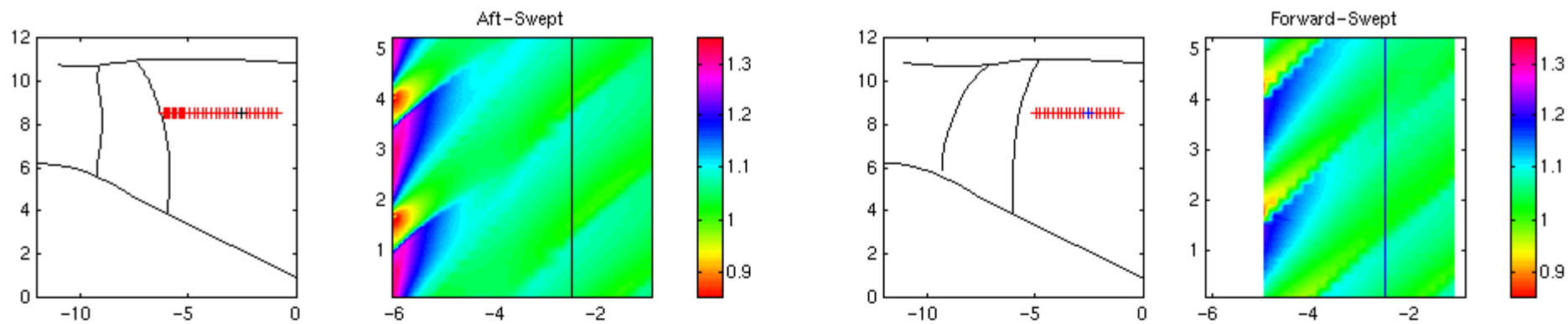


Relative Mach Number Distribution Across Rotor Rev

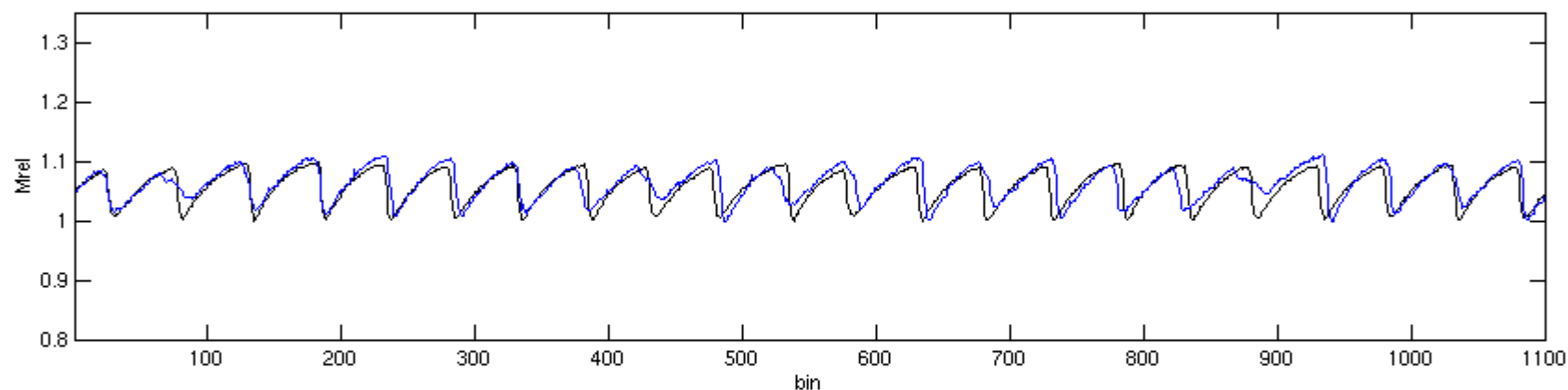


Autospectra of Relative Mach Number Distributions

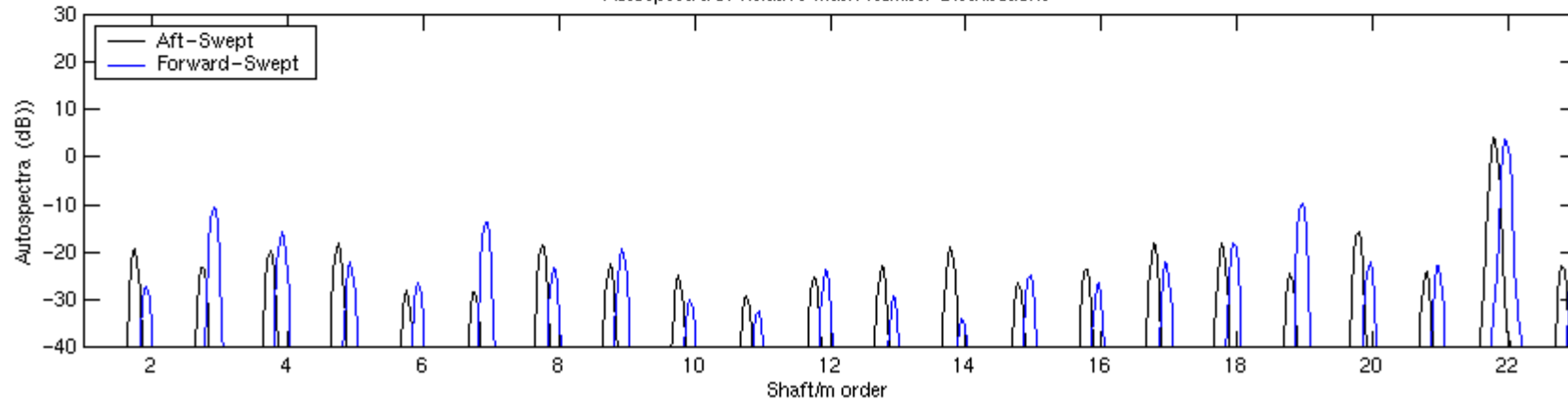


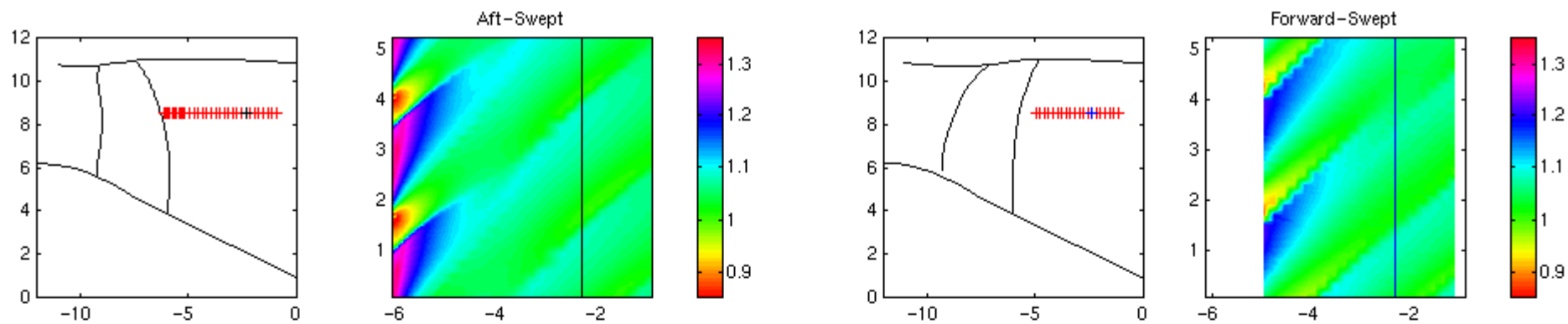


Relative Mach Number Distribution Across Rotor Rev

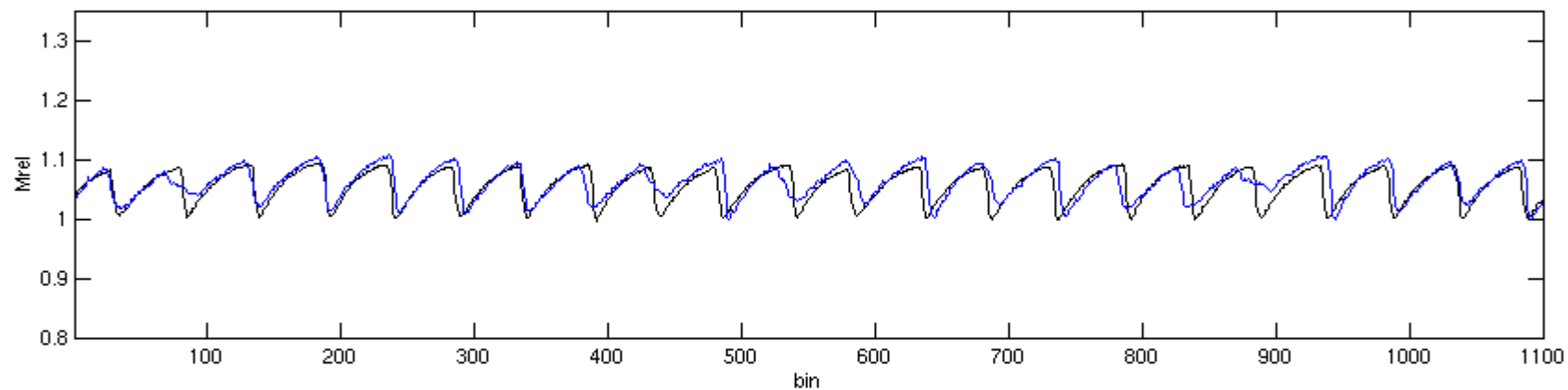


Autospectra of Relative Mach Number Distributions

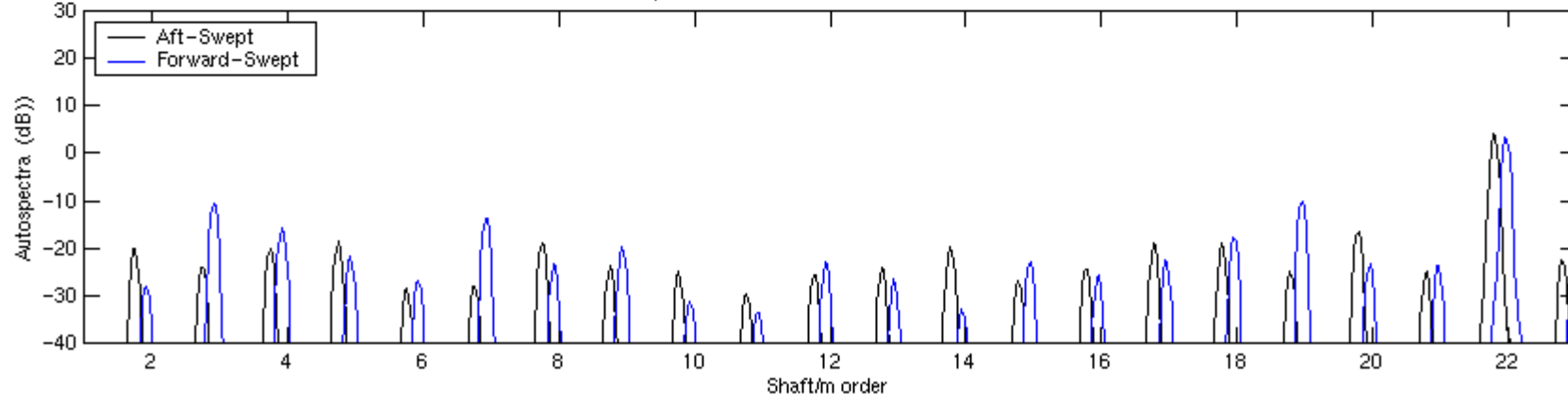


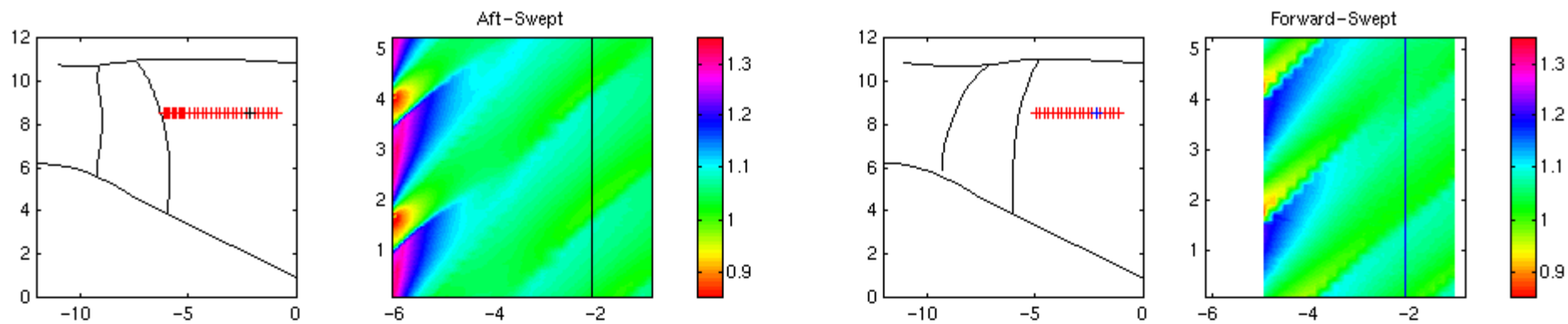


Relative Mach Number Distribution Across Rotor Rev

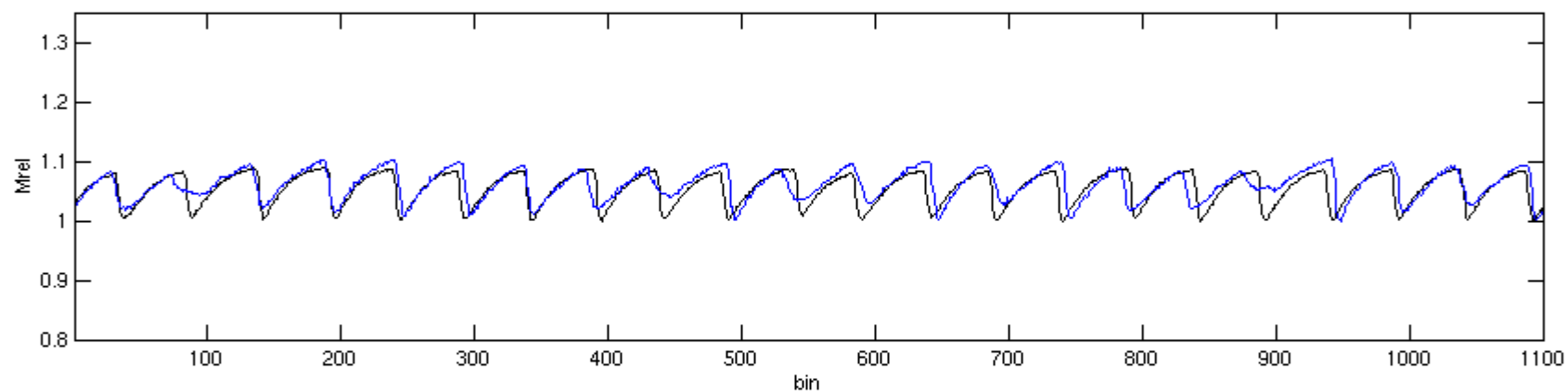


Autospectra of Relative Mach Number Distributions

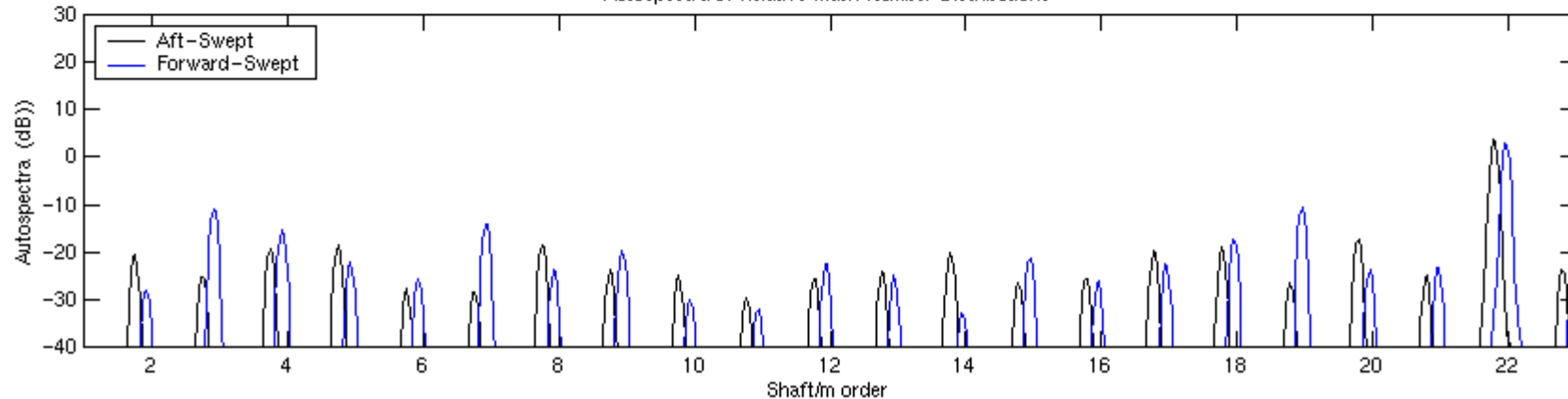


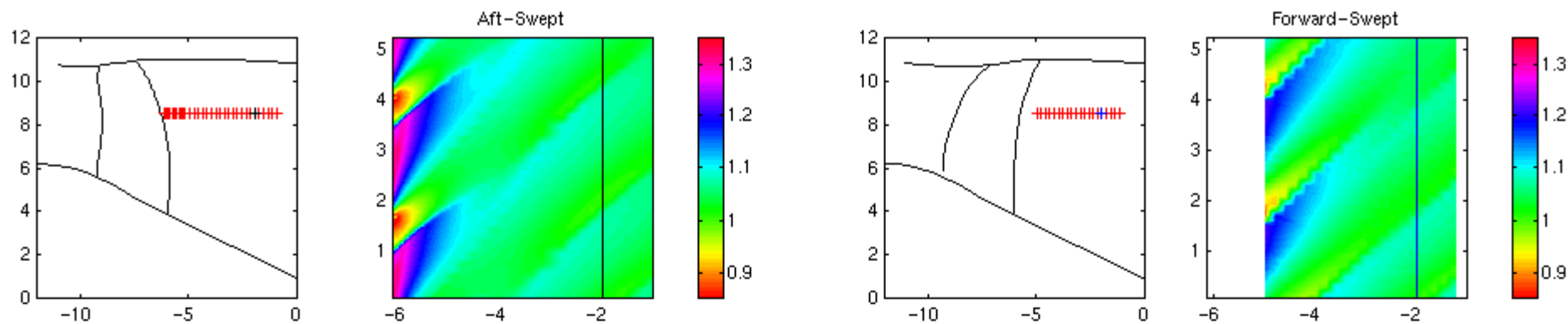


Relative Mach Number Distribution Across Rotor Rev

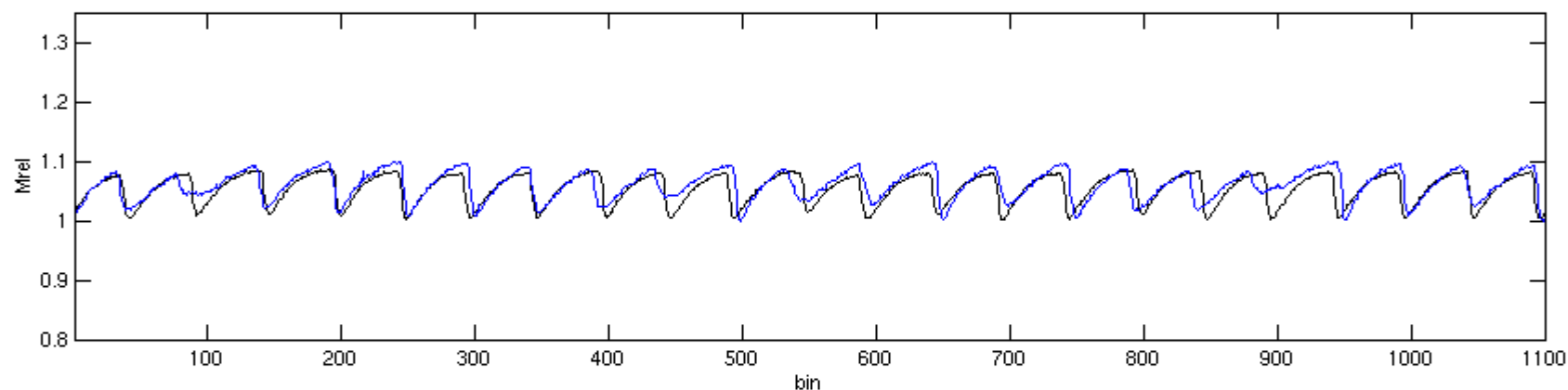


Autospectra of Relative Mach Number Distributions

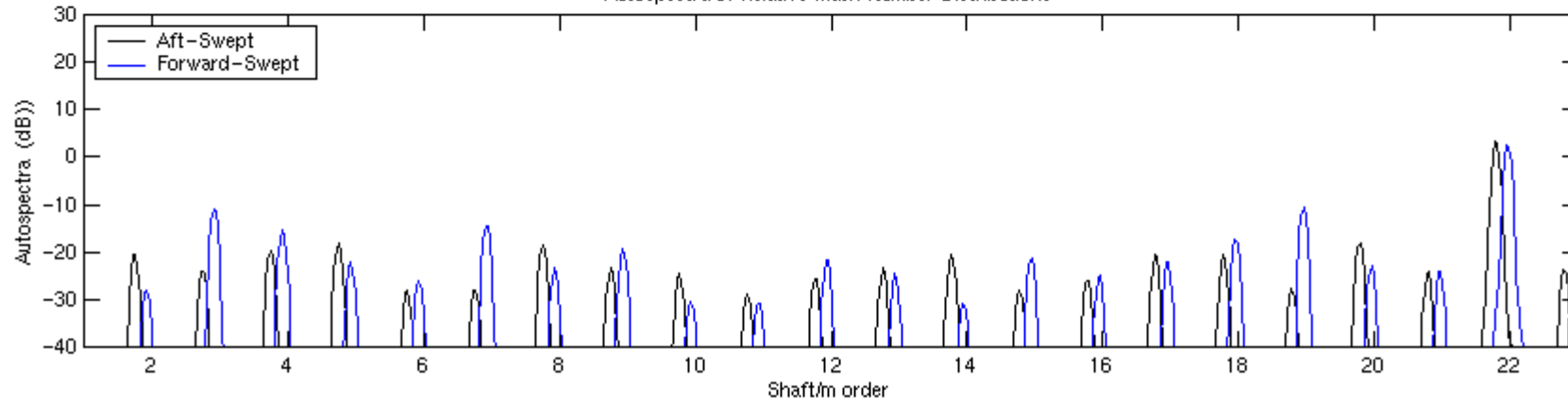


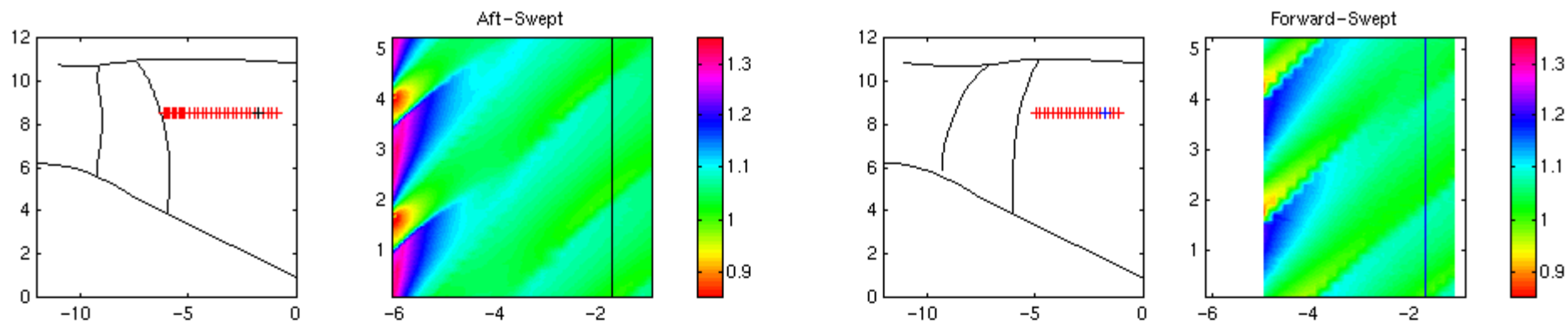


Relative Mach Number Distribution Across Rotor Rev

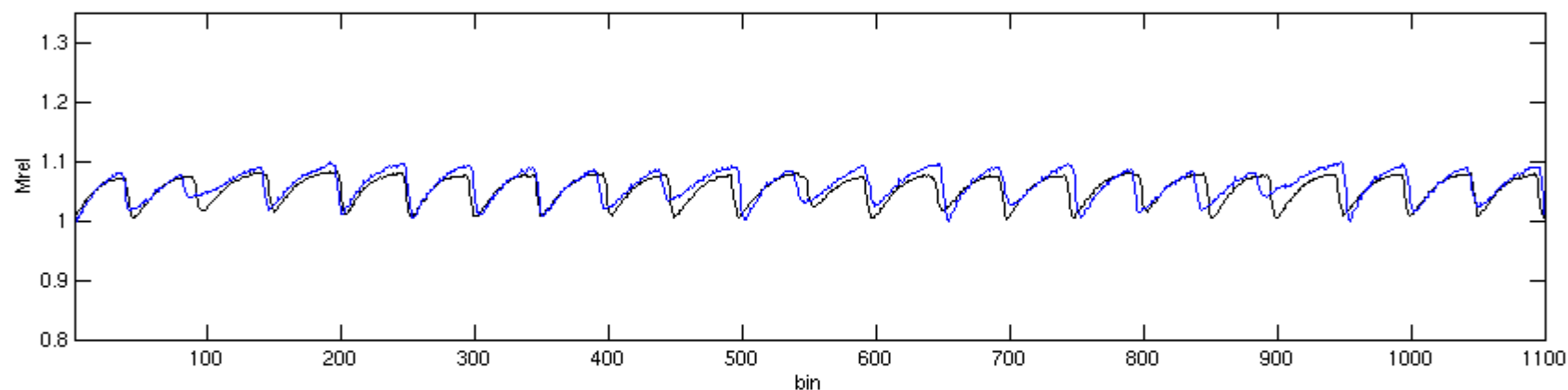


Autospectra of Relative Mach Number Distributions

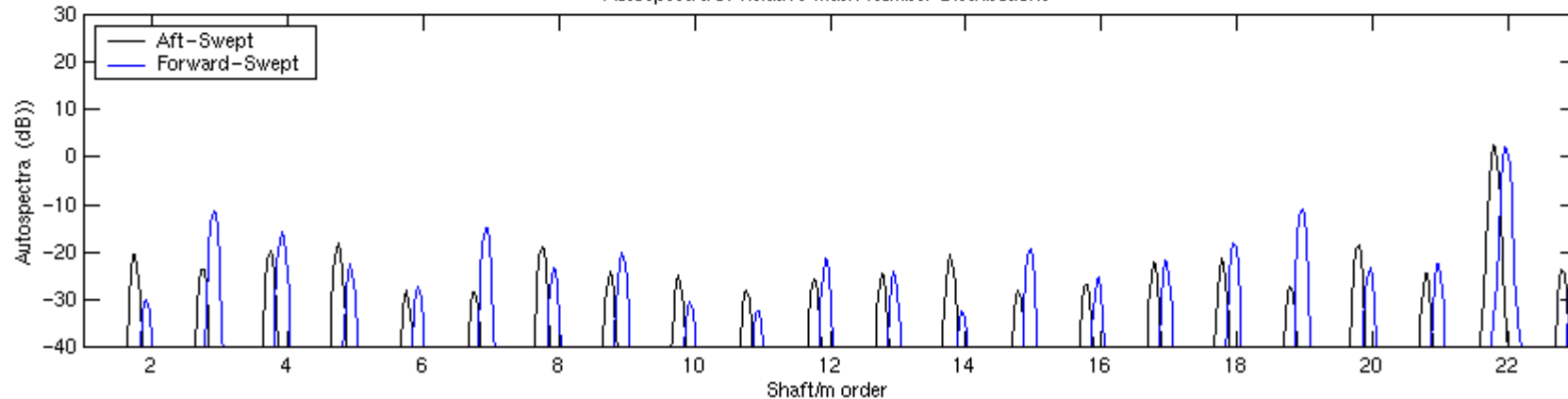


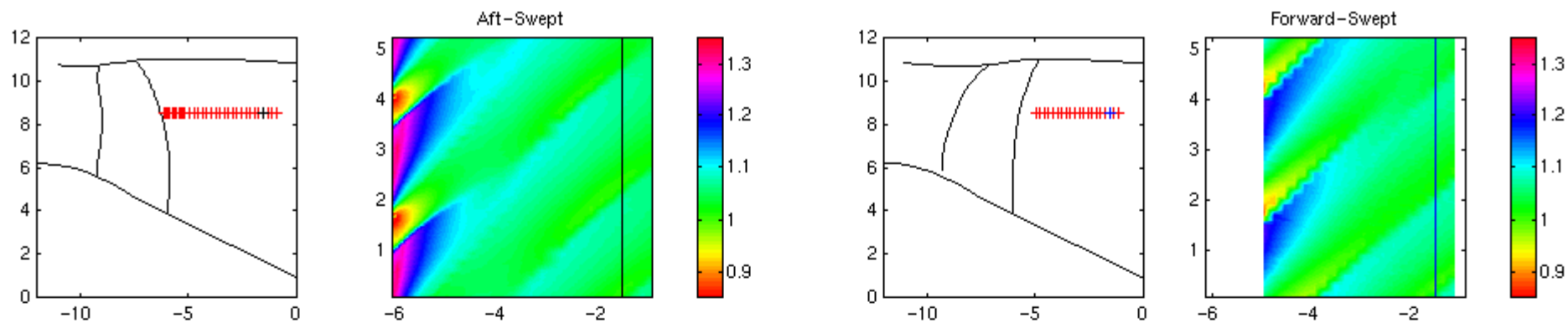


Relative Mach Number Distribution Across Rotor Rev

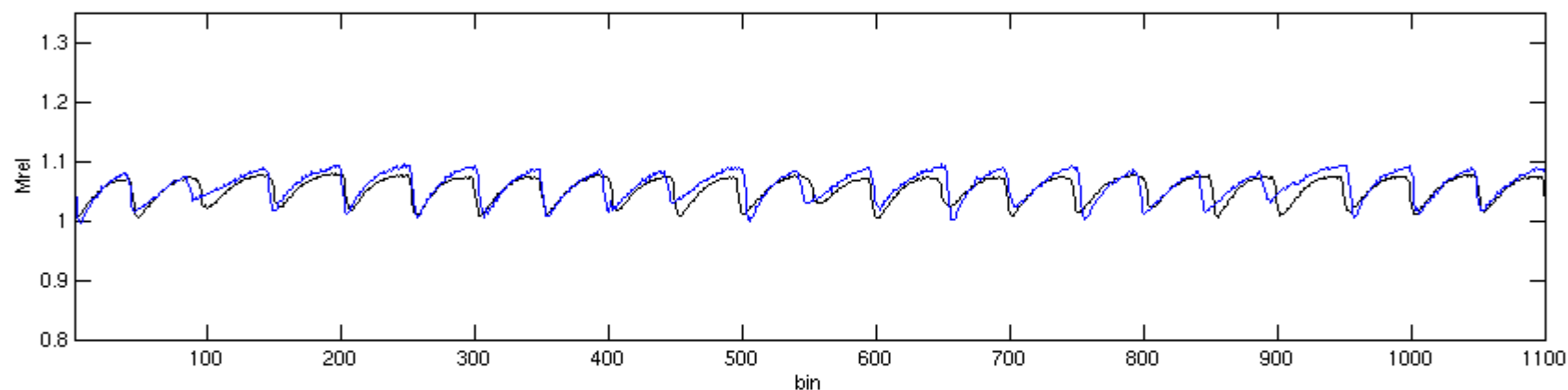


Autospectra of Relative Mach Number Distributions

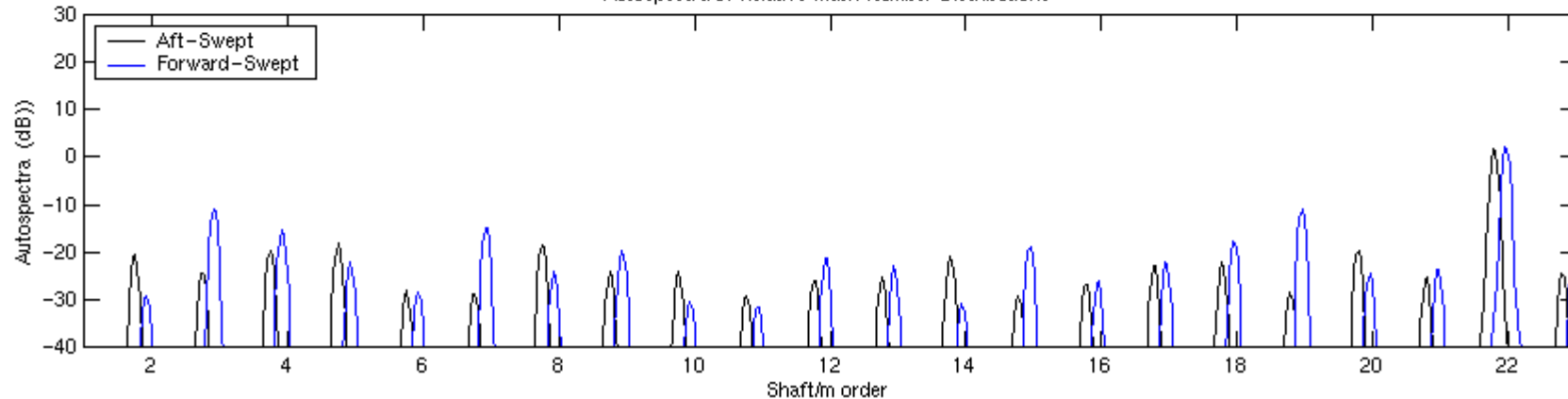


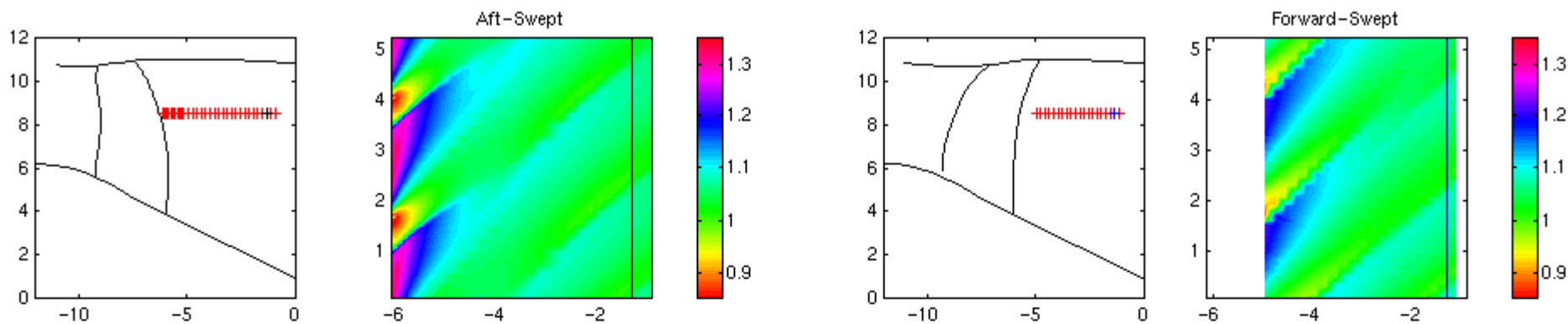


Relative Mach Number Distribution Across Rotor Rev

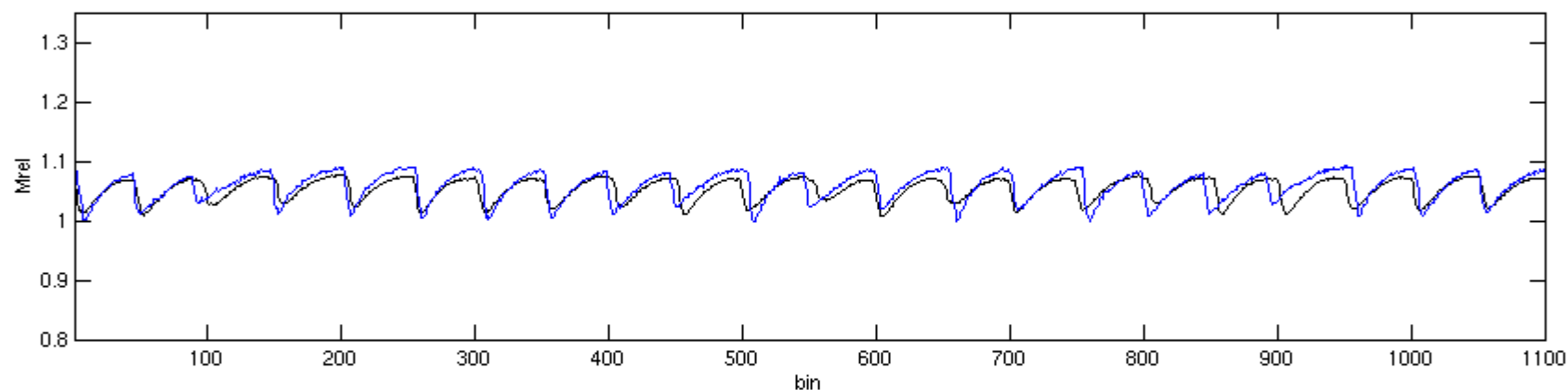


Autospectra of Relative Mach Number Distributions

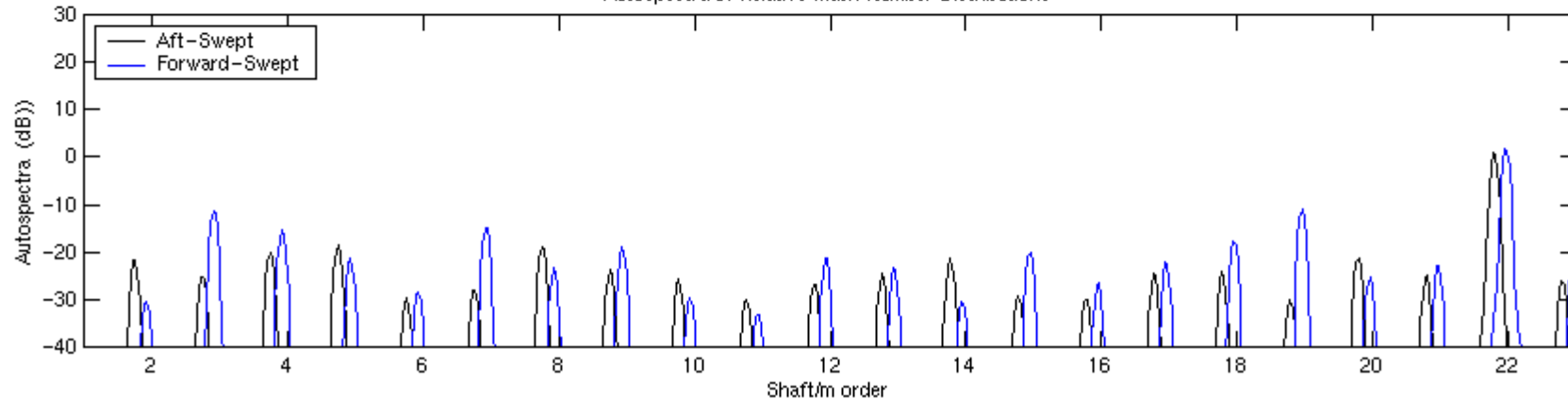


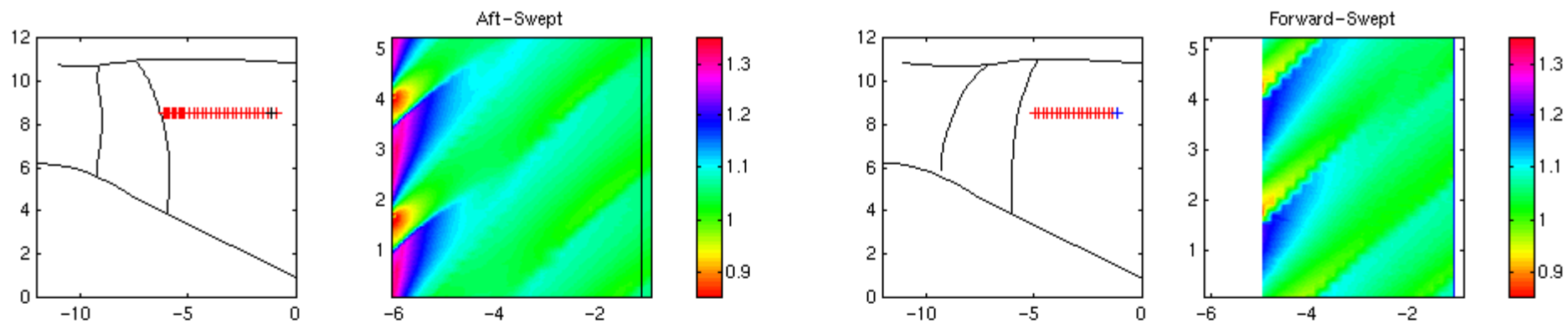


Relative Mach Number Distribution Across Rotor Rev

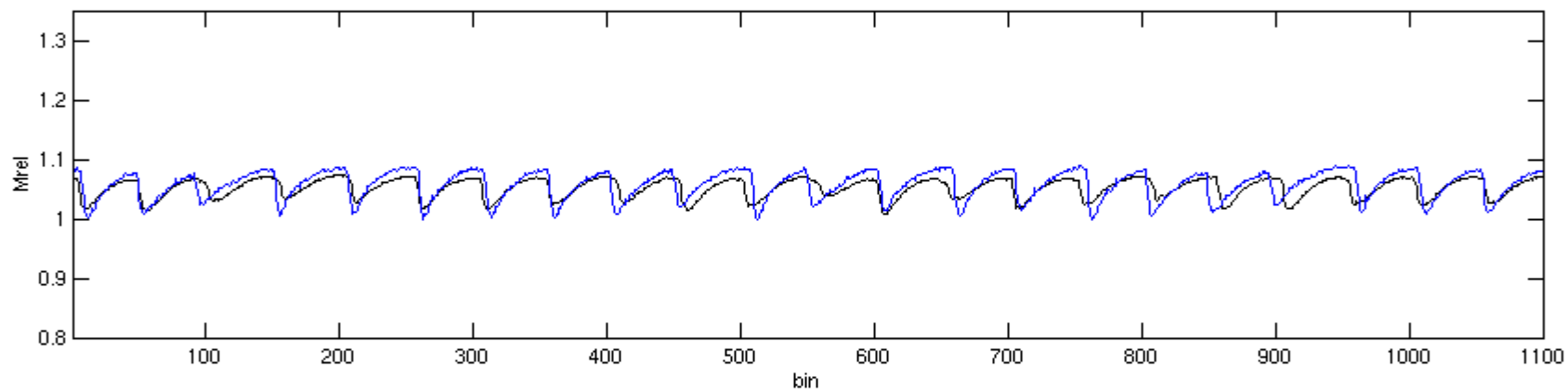


Autospectra of Relative Mach Number Distributions

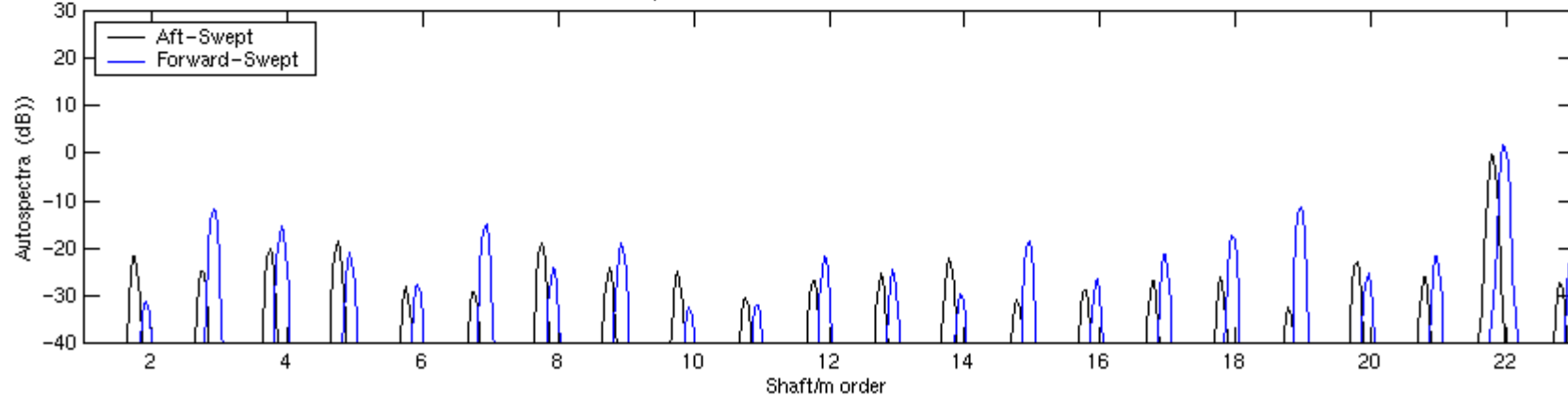




Relative Mach Number Distribution Across Rotor Rev



Autospectra of Relative Mach Number Distributions



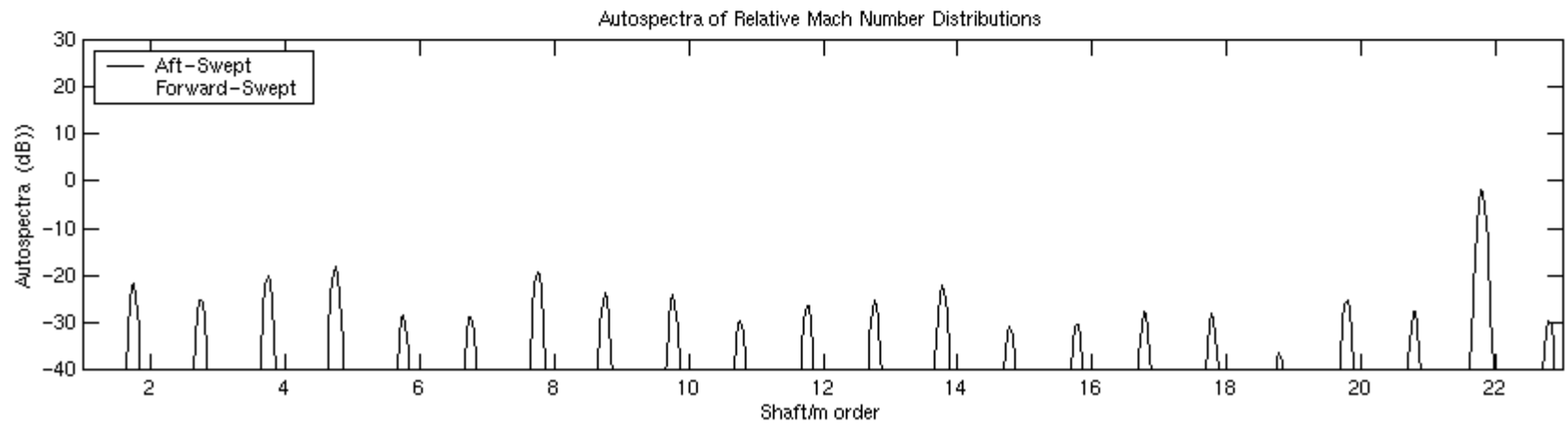
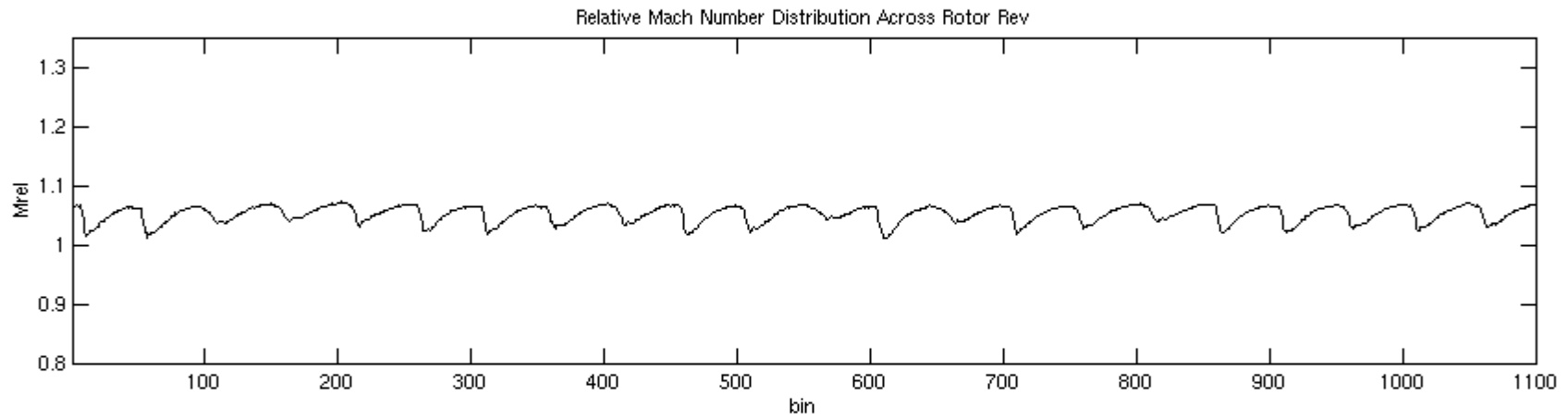
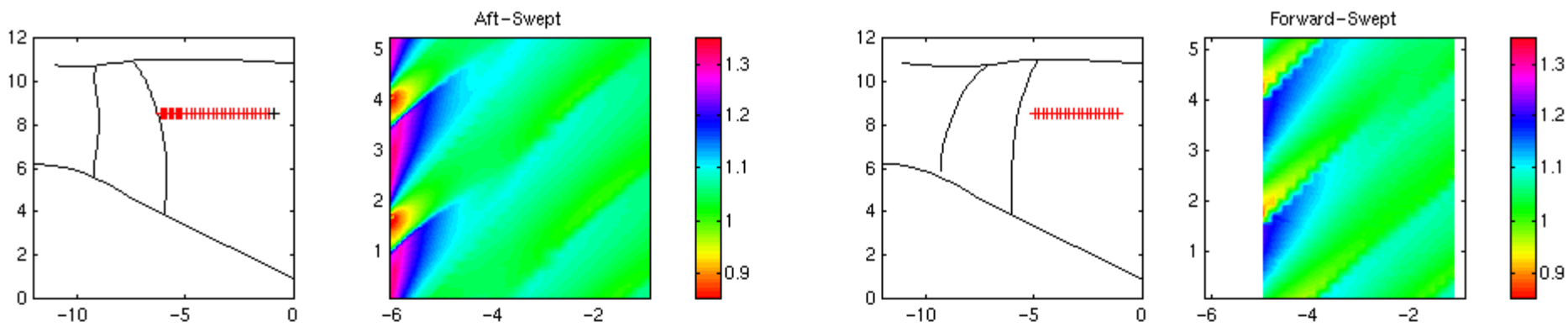


Figure 36.—Comparison of the decay of the disturbance measured upstream of the aft-swept and forward-swept fans at $r = 8.5$ in. with the rotors at the high-speed condition.

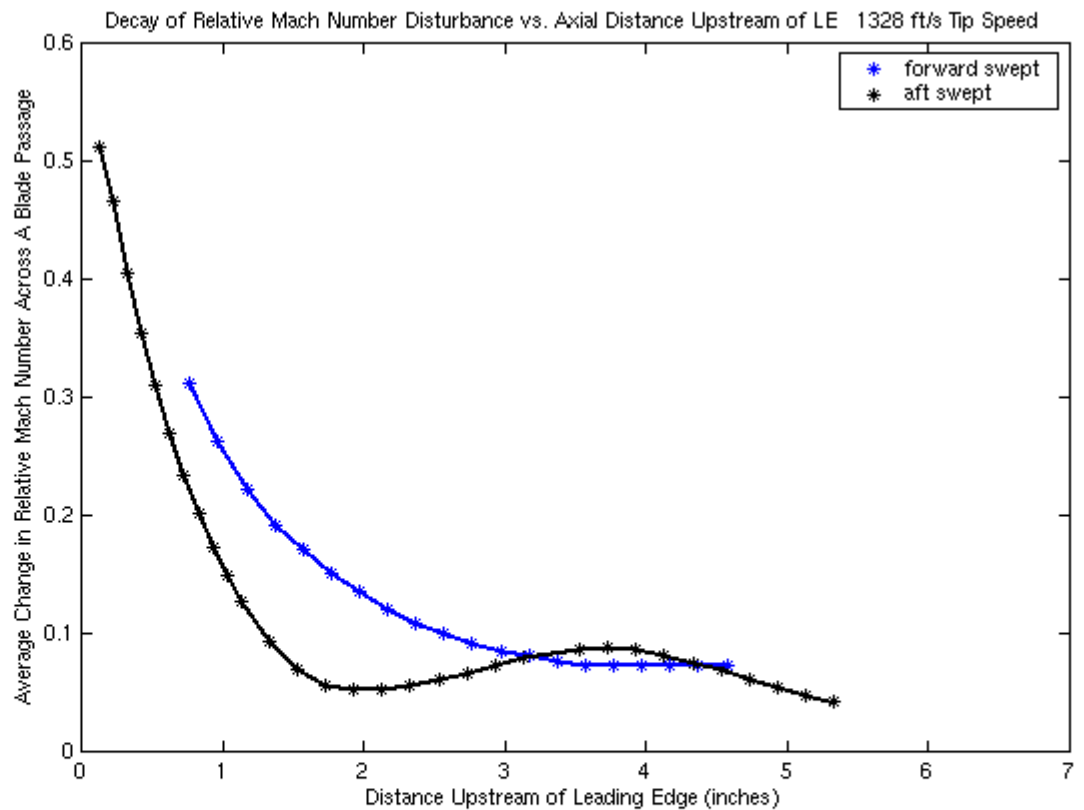
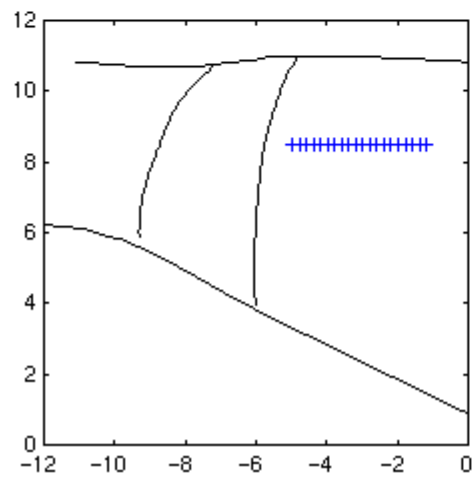
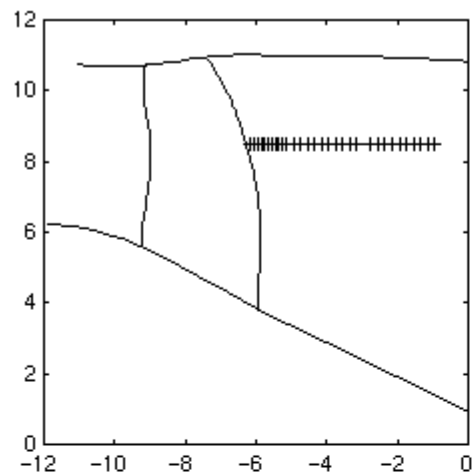


Fig Kg.m